SIEMENS

Artis zee/zeego VC14H/J

AX

DICOM Conformance Statement

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Network Conformance Statement

1 Conformance Statement Overview

The Artis zee/zeego is a "*syngo*®-based[a]" Imaging Modality. The Artis zee/zeego is designed to be integrated into an environment of medical, DICOM-based devices. The Artis zee/zeego supports Storage and Transfer of images utilizing the DICOM "Storage Service Class", the display of data and retrieval of images from DICOM Archives utilizing the DICOM "Query/Retrieve Service Class". Workflow Management is supported by querying worklists from RIS and returning information about the procedure performed. Furthermore the Import from and export to DICOM CD/DVD media is supported. Printing of viewing results is provided with Print Management Services.

Table 1 - Network Services

SOP Classes	User of Service (SCU)	Provider of Service (SCP)
Verification		
Verification	Yes	Yes
Transfer (Image SOP Class)		
Computed Tomography Image Storage	No	Yes
Magnetic Resonance Image Storage	No	Yes
X-Ray Angiographic Image Storage	Yes	Yes
Transfer (Non-image SOP Class)		
X-Ray Radiation Dose SR	Yes	Yes
Comprehensive SR (priv. "Quant Report" Templ.)	Option	Option
Transfer (Private SOP Class)		
Syngo Non-Image Storage	Yes	Yes
Workflow Management		
Modality Performed Procedure Step SOP Class	Option	No
Modality Worklist Information Model - FIND	Option	No
Storage Commitment Push Model SOP Class	Yes	Yes
Query/Retrieve		
Patient Root Q/R Information Model - FIND	Yes	Yes
Patient Root Q/R - Information Model - MOVE	Yes	Yes
Patient Root Q/R - Information Model - GET	No	Yes
Study Root Q/R - Information Model - FIND	Yes	Yes
Study Root Q/R - Information Model - MOVE	Yes	Yes
Study Root Q/R - Information Model - GET	No	Yes
Patient/Study Only Q/R - Information Model FIND	Yes	Yes
Patient/Study Only Q/R - Information Model MOVE	Yes	Yes
Patient/Study Only Q/R - Information Model GET	No	Yes
Print Management		
Basic Grayscale Print Management Meta	Yes	No
Print Job	Yes	No
Presentation LUT	Yes (for Grayscale)	No

Table 2 - Media Services

Media Storage Application Profile	Write Files (FSC or FSU)	Read Files (FSR)
Compact Disk - Recordable		
General Purpose on CD-R and DVD	Yes (see Note 1)	Yes
Basic Cardiac X-Ray on CD-R	Yes (see Note 2)	Yes
1024 X-Ray on CD-R	Yes	Yes

[a] *syngo* is a registered trademark of Siemens AG

DVD		
1024 X-Ray on DVD	Yes	Yes
General Purpose DVD with JPEG	Yes	Yes

Note 1: with uncompressed setting
Note 2: with “resize” (512x512) active and only cine multi-frames included

Table 3 - Implementation Identifying Information

Name	Value
Application Context Name	1.2.840.100008.3.1.1.1
Implementation Class UID	1.3.12.2.1107.5.4
Implementation Version Name	“SIEMENS_ARTISVC"

2 Table of Contents

1 Conformance Statement Overview 2
2 Table of Contents 4
3 Introduction 6
3.1 Revision History 6
3.2 Audience 6
3.3 Remarks 6
3.4 Definitions, Terms and Abbreviations 6
3.5 References 7
4 Networking 8
4.1 Implementation Model 8
4.1.1 Application Data Flow 8
4.1.2 Functional Definitions of Application Entities 11
4.1.3 Sequencing of Activities 13
4.2 Application Entity Specification 14
4.2.1 Verification SCU AE Specification 14
4.2.2 Storage SCU AE Specification 16
4.2.3 Storage SCP AE Specification 20
4.2.4 Query/Retrieve SCU Specification 25
4.2.5 Query/Retrieve SCP Specification 30
4.2.6 Print SCU Specification 37
4.2.7 Worklist SCU AE 45
4.2.8 Modality PPS SCU AE 52
4.3 Network Interfaces 58
4.3.1 Physical Network Interface 58
4.3.2 Additional Protocols 58
4.4 Configuration 58
4.4.1 AE Title/Presentation Address Mapping 58
4.4.2 Parameters 60
5 Application Profile Conformance Statement 62
5.1 Implementation Model 62
5.1.1 Application Data Flow Diagram 62
5.1.2 Functional Definitions of AEs 63
5.1.3 Activities 63
5.1.4 Implementation Identifying Information 63
5.2 AE Specifications 64
5.2.1 DICOM Archive Specification 64
5.3 Augmented and Private Application Profiles 65
5.4 Media Configuration 66
5.4.1 Single- / Multi-Session CD burning 66
5.4.2 “Viewer on CD” 66
5.4.3 Auto-Labeling 66

6 Support of Extended Character Sets 67

7 Security 69

8 Annexes 70

8.1 IOD Contents 70
8.1.1 Created SOP Instances 70
8.1.2 Usage of attributes from received IODs 78
8.1.3 Attribute mapping 78
8.1.4 Coerced/Modified fields 78

8.2 Data Dictionary of private Attributes 79

8.3 Coded Terminology and Templates 83

8.4 Grayscale Image Consistency 83

8.5 Standard Extended/Specialized/Private SOP Classes 84
8.5.1 Standard Extended XA 84
8.5.2 Standard Extended for other created SOP Class 90

8.6 Private Transfer Syntaxes 92

8.7 Sorting Order Artis zee/zeego 93
8.7.1 Identification of Images 93
8.7.2 The Sorting Algorithms of the Artis Viewer 94
8.7.3 The Sorting Algorithms of the Artis Browser 98

8.8 Supported Matrix Sizes of Artis zee/zeego 99

8.9 DICOM Print SCU - detailed status displays 100
8.9.1 Common Status Information 100
8.9.2 Additional Status Information - AGFA printers 103
8.9.3 Additional Status Information - Kodak PACS Link (formerly Imation) 104
8.9.4 Additional Status Information - Kodak 190I 104
8.9.5 Additional Status Information - Kodak 2180/1120 104
8.9.6 Additional Status Information - Codonics 104
8.9.7 Additional DICOM Execution Status Information 105
8.9.8 Unknown DICOM Execution Status Information 106

Annex A: Index of Tables 107

3 Introduction

3.1 Revision History

Table 4 - Revision History

Product	Product Version	Document Version	Date	Description
Artis zee	VC13	Rev. 07	15-Apr-08	Version for Final Text
Artis zee	VC14	Rev. 08	26-June-09	Version for Final Text
Artis zee/zeego	VC14H/J	Rev. 09	12-Mar-12	Version for Final Text

3.2 Audience

This document is intended for hospital staff, health system integrators, software designers or implementers. It is assumed that the reader has a working understanding of DICOM.

3.3 Remarks

DICOM, by itself, does not guarantee interoperability. However, the Conformance Statement facilitates a first-level validation for interoperability between different applications supporting the same DICOM functionality as SCU and SCP, respectively.

This Conformance Statement is not intended to replace validation with other DICOM equipment to ensure proper exchange of information intended.

The scope of this Conformance Statement is to facilitate communication with Siemens and other vendors' medical equipment. The Conformance Statement should be read and understood in conjunction with the DICOM Standard [NEMA PS3]. However, by itself it is not guaranteed to ensure the desired interoperability and a successful interconnectivity.

The user should be aware of the following important issues:

- The comparison of conformance statements is the first step towards assessing interconnectivity between Artis zee/zeego and other DICOM-conformant equipment.
- Test procedures should be defined and tests should be performed to validate the connectivity desired. DICOM itself and the conformance parts do not specify this.

3.4 Definitions, Terms and Abbreviations

Definitions, terms and abbreviations used in this document are defined within the different parts of the DICOM standard.

Additional Abbreviations and terms are as follows:

AE	DICOM Application Entity
AET	Application Entity Title
ASCII	American Standard Code for Information Interchange
CSE	Customer Service Engineer

DB	Database
DCS	DICOM Conformance Statement
DICOM	Digital Imaging and Communications in Medicine
FSC	File Set Creator
FSR	File Set Reader
FSU	File Set Updater
GSDF	Grayscale Standard Display Function
IHE	Integrating the Healthcare Enterprise
IOD	DICOM Information Object Definition
ISO	International Standard Organization
MPPS	Modality Performed Procedure Step
n. a.	not applicable
NEMA	National Electrical Manufacturers Association
PDU	DICOM Protocol Data Unit
RP	Reference Point
SCU	DICOM Service Class User (DICOM client)
SCP	DICOM Service Class Provider (DICOM Server)
SOP	DICOM Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Report
TFT	Thin Film Transistor (Display)
TID	Template ID
UID	Unique Identifier
UTF-8	Unicode Transformation Format-8
VR	Value Representation

3.5 References

[NEMA PS3] Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/[b]

[b] *The DICOM Standard is under continuous maintenance, the current official version is available at http://dicom.nema.org*

4 Networking

4.1 Implementation Model

- **Verification**
  The Artis zee/zeego DICOM Service Tool application requests Verification to proof the ability of a remote DICOM application to respond to DICOM messages. Responding to Verification requests from remote nodes is handled by the Storage SCP.
- **Storage**
  The Artis zee/zeego DICOM implementation is able to initiate associations for Storage of DICOM Composite Information Objects to Remote AEs and to receive and respond to associations for Storage from Remote AEs.
- **Storage Commitment**
  The Artis zee/zeego DICOM implementation is able to initiate requests for Storage Commitment Push (for previously sent DICOM Composite Information Objects) to Remote AEs and is able to receive and respond to Storage Commitment requests from Remote AEs.
- **Query/Retrieve**
  The Artis zee/zeego DICOM application supports the query/retrieve services in a SCP role. Via the user interface, Artis zee/zeego supports Query/Retrieve as SCU to retrieve IODs to the local database.
- **Print**
  The Artis zee/zeego DICOM implementation is able to initiate associations as Print Management SCU for printing of composed film-sheets with one or more DICOM Print AE.
- **Workflow**
  The Artis zee/zeego will issue automated “broad” worklist queries and interactive “narrow” worklist queries as DICOM Modality Worklist SCU. The status of the procedure started and performed is communicated via MPPS, which is also supported in SCU role only. Radiation Dose information is also sent via MPPS.

4.1.1 Application Data Flow

The division of Artis zee/zeego into the separate DICOM Application Entities represents a somewhat arbitrary partitioning of functionality. For the purpose of this document they are organized in this manner to detail their independent logical functionality.

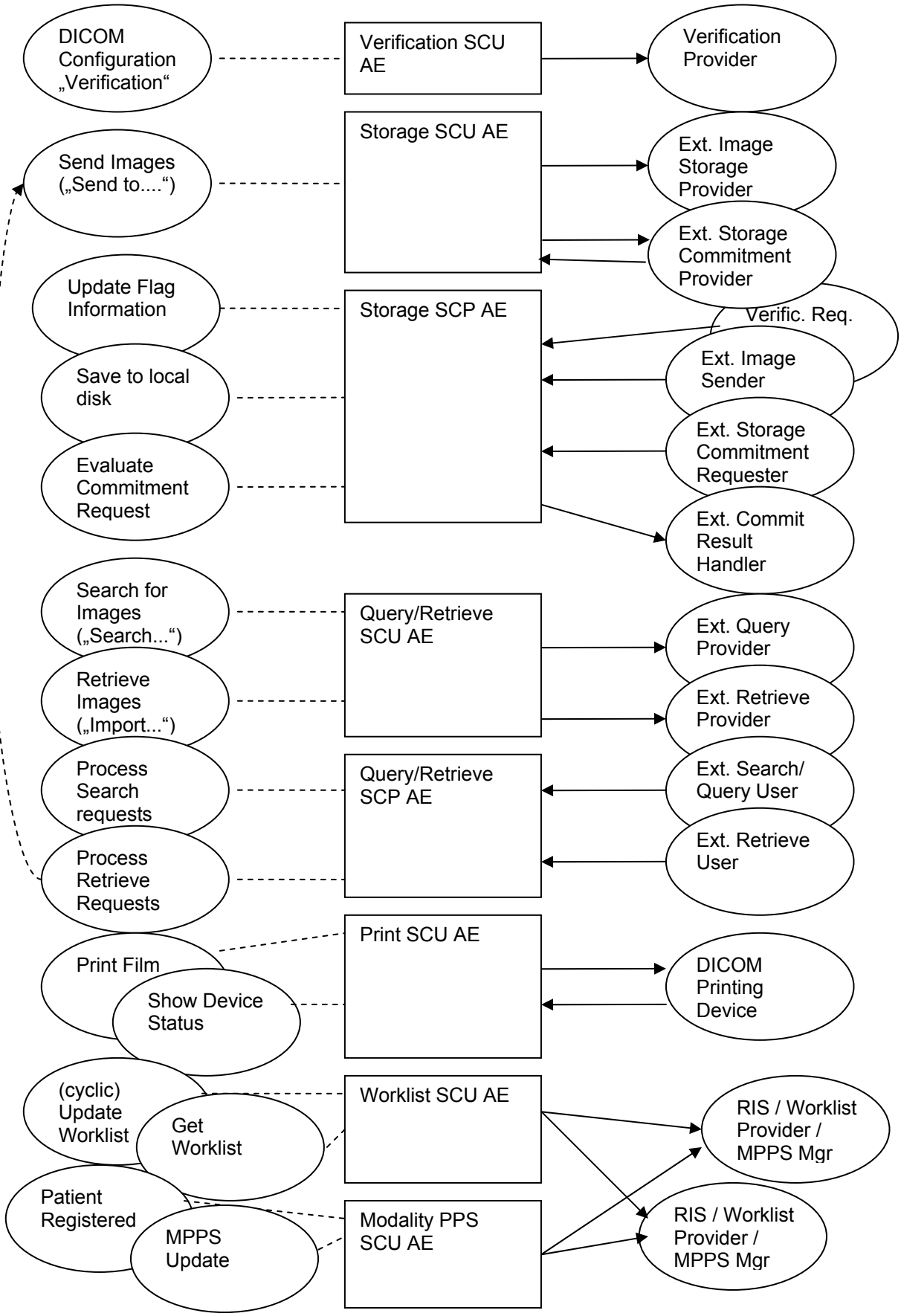

Table 5 - Artis zee/zeego DICOM Data Flow Diagram

- The Artis zee/zeego DICOM Service Tool application opens an association when a "verification" of a remote application is requested during a configuration session. This can be done when entering new data to configure a remote application or to verify existing configuration data.
- The Storage SCU AE can send Composite SOP Instances and automatically request Storage Commitment for sent SOP Instances, if configured.
  The Storage SCU AE also requests Storage Commitment results and handles incoming commitment status N-EVENT messages.
- The Storage SCP AE can receive incoming DICOM images and add them to the local database. It can respond to external Storage and Verification Requests as a Service Class Provider (SCP) for C-STORE and C-ECHO requests. The Storage SCP AE autonomously handles incoming Storage Commitment requests in SCP role and checks commitment status based on the local database and sends back the related commitment status in N-EVENT-REPORT messages.
  The Storage SCP AE supports Composite SOP Instances as indicated in Chapter "Conformance Statement Overview".

- The Query part of the Query/Retrieve SCU AE uses C-FIND to search a DICOM Database for Patient Study and Series information.
  The Retrieve part of the Query/Retrieve SCU AE uses C-MOVE to initiate a DICOM transfer of composite objects to the local database.
- The Query SCP AE runs autonomously in the background and responds to incoming C-FIND requests based on the matches in the local database and supports retrieve of supported SOP Instances from the local database to a known retrieve destination.
- The Print SCU sends previously compiled, complete (virtual) film-sheets in 1:1 image mode (page mode) to the printer. The printer status is cyclically monitored by sending Status requests and/or awaiting asynchronous events.
- The Worklist SCU AE runs autonomous for cyclic "broad" query and issues C-FIND Worklist model requests. It can be manually triggered for most recent data. A "broad" query with user input can be triggered separately.
- The MPPS AE uses N-CREATE when registering an Acquisition patient and updates via N-SET with each run. User can close MPPS interactively (triggers "final N-SET").

4.1.2 Functional Definitions of Application Entities

4.1.2.1 Functional Definition of Verification-SCU AE

The Artis zee/zeego DICOM Service Tool application opens an association when a "verification" of a remote application is requested during a configuration session. This can be done when entering new data for remote application configuration or to verify existing configuration data.

4.1.2.2 Functional Definition of Storage-SCU AE

The Artis zee/zeego Storage SCU is invoked by the job control interface that is responsible for processing network archival tasks. The job consists of data describing the composite image objects selected for storage and the destination. An association is negotiated with the destination application entity and the image data is transferred using the C-STORE DIMSE-Service. Status of the transfer is reported to the job control interface.

With each successfully completed send job, the Artis zee/zeego DICOM Application will populate the Storage Commitment Push Model Action Information from the SOP Instances sent. Then a Storage Commit Request is triggered, if configured. Depending on configuration, the Artis zee/zeego DICOM application will keep the association open for responses with a configurable time-out, or closes the association and expects responses on a different association that has to be establishes by the remote Storage Commitment SCP.

The commitment status derived from the related trigger response will be indicated in the related Status Flags of the related entity. It is possible to create triggers (“auto rules”) from this event.

The Transaction UIDs of the pending commitment request are kept “open” (Job-status is “waiting”) for a configurable time (default: 1h). If the “open time” for a pending commitment request has elapsed w/o a related response from the provider, the Transaction UID is removed and the related entities are indicated as “commit failed”.

Open Transaction UIDs of pending commitment requests are discarded after a reboot of the system. The related entities are indicated as “commit failed”.

4.1.2.3 Functional Definition of Storage-SCP AE

The Storage SCP component of the Artis zee/zeego DICOM application is operating as background server process. The process starts when the machine is powered on and waits for Storage association requests. Upon accepting an association with a negotiated Presentation Context it starts to receive the Composite Image Objects and imports them to local database.

The Verification SCP is included in the Storage SCP.

The Storage Commitment SCP is running in background and is ready to receive requests when the system is started. Storage Commitment will be checked and returned against the SOP Classes received and kept in the local Storage of the Artis zee/zeego. The response will either be sent “on same” (association not closed by requester) or “on separate” association (requester closed association consecutive to positive request status).

4.1.2.4 Functional Definition of Query/Retrieve-SCU AE

The Artis zee/zeego DICOM query/retrieve SCU requests the remote query/retrieve SCP to perform a search and match to the keys specified in the request in order to display the results in the system’s user interface. Depending on user action (Import) the Artis zee/zeego query/retrieve

DICOM SCU sends a C-MOVE DIMSE service to initiate a C-STORE sub-operation on the SCP to start an image transfer from remote Storage SCU (running on Query/Retrieve SCP) to the system's Storage SCP.

4.1.2.5 Functional Definition of Query/Retrieve-SCP AE

The Artis zee/zeego DICOM query/retrieve SCP responds to C-FIND DIMSE services from remote SCU applications. Depending on further remote request, a C-GET or a C-MOVE involves the system's DICOM query/retrieve SCP application to initiate a C-STORE association to send image objects to a remote Storage SCP.

All components of the DICOM query/retrieve SCP application are operating as background server processes. The processes start when the machine is powered on and then respond to queries based on the records stored in its database.

4.1.2.6 Functional Definition of Print SCU AE

The Print SCU is invoked by the user interface to setup film-sheet layout and whenever an image is ready to be printed on film. The Print SCU will hold and maintain all data needed to compile a complete film-sheet from the data (images, layout, configuration) received. Whenever a film-sheet is ready to print the related data is used to supply the Information to the SOP Classes of the Print Management Service Class. A queue is maintained, in order to intermediately store several film-sheets in case of resource problems on printer. The SCU will only supply and require the mandatory SOP Classes of the Print Management Service Class.

4.1.2.7 Functional Definition of Worklist SCU AE

The worklist SCU ("broad query") is invoked from the patient browser user interface or by timer to request the worklist from a remote Information System (Modality Worklist Class SCP). The worklist SCP responses to the C-FIND query and scheduled imaging service requests (scheduled procedure steps) and patient demographic information will be "pulled" from the information system to the Artis zee/zeego modality. All information retrieved will be held in the scheduling database for usage during Patient registration procedure.

Furthermore, the patient based Query dialog from the patient browser allows to enter specific matching criteria ("narrow query") for the worklist query. With the response data the Patient Registration dialog can be populated according availability within the worklist response identifier.

4.1.2.8 Functional Definition of Modality PPS SCU AE

With registering a Patient (i.e. a Scheduled Procedure Step from Worklist), the Artis zee/zeego DICOM application will create a MPPS Instance and communicate it to the MPPS Manager (SCP). It is configurable to set the states of all related MPPS to "Completed" when a patient is closed. Furthermore, a manual update can be performed with the MPPS user interface. From the user interface it is possible to set the state of the MPPS to "Completed" or "Discontinued". After that the DICOM application will no longer allow updates on the related MPPS Instance.

The Artis zee/zeego will not only allow a "1:1 -relationship" of Scheduled Procedure Steps and Performed Procedure Steps, but also supports the "simple group-case" (grouping several SPS of the same Requested Procedure) , "complex group-case" (grouping several SPS from different Requested Procedures) and "append case" from the respective IHE-scenarios.

The Artis zee/zeego will support creation of "unscheduled cases" by allowing MPPS Instances to be communicated for locally registered Patients.

4.1.3 Sequencing of Activities

4.1.3.1 Verification

Newly entered data have to be saved first, before a “verification” of these data is possible.

4.1.3.2 Storage

Prior to sending of SOP Instances the Artis zee/zeego Storage application is capable of invoking processing and resizing features in order to prepare image pixel contents into convenient formats for certain multi-vendor environments.

The Storage Commitment trigger is automatically derived from the successful completion of a Send Job.

4.1.3.3 Query/Retrieve

Retrieve of images is only possible if a result from a previous “Search...” operation exists and those entities can be selected for “Import”.

The Query application will not “per se” request information on IMAGE level. The user can select a series and request image level information with the “Image List” function.

4.1.3.4 Workflow

The “narrow” (interactive) Worklist Query requires that sufficient matching keys or an unique matching key are/is entered before the query is issued. Only then a single response can be expected to complete the registration dialog.

An MPPS N-CREATE message is sent when a patient is registered. For procedure steps registered as "emergency" cases the MPPS N-CREATE is withheld until it is set to completed.

MPPS N-SET messages to update the information are sent after each X-Ray event.

4.2 Application Entity Specification

4.2.1 Verification SCU AE Specification

4.2.1.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section "Verification" in the “Conformance Statement Overview”.

4.2.1.2 Association Policies

4.2.1.2.1 General

The Artis zee/zeego DICOM Service Tool application attempts to open an association for verification request whenever the "verification" function is activated during network configuration of a remote DICOM application.

4.2.1.2.2 Number of Associations

The Artis zee/zeego DICOM Service Tool application initiates one association at a time to request verification.

4.2.1.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.1.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.1.3 Association Initiation Policy

4.2.1.3.1 Activity – “Verification”

4.2.1.3.1.1 Description and Sequencing of Activity

The Verification SCU C-ECHO request is initiated by Service and Configuration SW whenever "Verification" is requested. If an association to a remote Application Entity is successfully established, Verification with the configured AET is requested via the open association. If the C-ECHO Response from the remote Application contains a status other than "Success" this will be indicated in the service environment and the association is closed.

4.2.1.3.1.2 Proposed Presentation Contexts

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 6 - Presentation Context Table "Verification"

Presentation Context Table – “Verification”					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Verification	1.2.840.10008.1.1	Explicit VR Little Endian Implicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2 1.2.840.10008.1.2.2	SCU	None

4.2.1.3.1.3 SOP Specific Conformance – Verification SCU

The Application conforms to the definition of the Verification SCU in accordance to the DICOM Standard.

4.2.1.4 Association Acceptance Policy

The Verification SCP is part of the Storage SCP.

4.2.2 Storage SCU AE Specification

4.2.2.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services”, sections “Transfer” and “Workflow Management”.

4.2.2.2 Association Policies

4.2.2.2.1 General

The DICOM Storage application will be triggered by the transfer job queue or by an external retrieve request. An association request is sent to the destination AE and, upon successful negotiation of a Presentation Context, the transfer is started. Depending on configuration, processing or resizing can be applied to the images prior to being sent.

With a Send Job successfully completed, the DICOM application will generate the Storage Commitment Action Information which references to all Instances of the processed job. The Commit Request is sent over a single opened association. The Artis zee/zeego will wait for Status responses of the Storage Commitment Request. If the Provider accepts the Storage Commitment with Success Status, the generated Transaction UID, together with study identification data and a time-stamp, is kept. Depending on configuration, the association is closed or kept open for a configured time range. If the association is closed immediately, the response is expected on a different association which is the default setting. Multiple Storage Commitment Requests can be pending.

The default PDU size used will be 32KB.

4.2.2.2.2 Number of Associations

The Artis zee/zeego DICOM application initiates several associations at a time, one for each destination to which a transfer request is being processed in the active job queue list.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.2.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.2.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.2.3 Association Initiation Policy

If a job with network destination gets active in the job list or a retrieve sub-operation is processed, the Artis zee/zeego DICOM application attempts to initiate a new association for

DIMSE C-STORE to send images and with successful status and

N-ACTION DIMSE for the Storage Commitment Push Model Service Class to request commitment.

4.2.2.3.1 Activity – "Send to …"

4.2.2.3.1.1 Description and Sequencing of Activity

The C-STORE request is triggered by a job with network destination or the processing of an external C-MOVE retrieve request. If the process successfully establishes an association to a remote Application Entity, it will transfer each image one after another via the open association. Processing features and resizing of the pixel matrix can be applied as part of the transfer. If the C-STORE Response from the remote Application contains a status other than "Success" or "Warning", the association is aborted.

With success status for the previous transfer, the Artis zee/zeego Storage application sends the commit request (N-ACTION-RQ) message and waits for acceptance of this request (N-ACTION-RSP). After receiving this, the transaction is marked as "waiting".

Depending on a configuration value, the association will then be closed or kept open. In the first case, there is another configurable timeout giving the number of hours (h) and minutes (m) (by default 1h:0m) to wait for the corresponding commit response (N-EVENT-REPORT). In the second case, this time is the (also configurable) time-out for the association being kept open. In both cases, if the commit response (N-EVENT-REPORT) does not arrive within the configured time-out, the transaction will be marked as failed.

If the commit response (N-EVENT-REPORT) received has the status of "complete - failure exists", the transaction is marked as failed, else the transaction is marked as "completed". In both cases, a status message is shown to the user.

4.2.2.3.1.2 Proposed Presentation Contexts

The Artis zee/zeego DICOM application will propose Storage SCU Presentation Contexts as shown in the following table:

Table 7 - Presentation Context Table "Send to ..."

Presentation Context Table – "Send to …"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Any image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Image SOP Class)".	JPEG Lossy Extended JPEG Lossless, Process 14 (selection value 1) JPEG Lossy Baseline (Process 1) Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Any non-image SOP Class detailed in "Table 1 - Network Services" section „Transfer (Non-image SOP Class)".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Private SOP Class as detailed in Chapter "Table 1 - Network Services" section „Transfer (Private SOP Class)".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None
Storage Commitment SOP Class as detailed in "Table 1 - Network Services" section "Workflow Management".	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.2.3.1.3 SOP specific Conformance - “Send to …”

The Artis zee/zeego can send images in different formats. In a destination specific service level configuration it can be configured if images are sent original, resized (512x512 8 bit, 1024x1024 12 bit) and/or processed.

For association and DIMSE level time-outs, please refer to section Configuration (4.4.2 Parameters) of this document.

4.2.2.3.1.3.1 Optional Attributes

Please refer to the related Image Object definition tables in the Annex (section “Created SOP Instances”) for a list of all DICOM IOD attributes of type 2 and 3, which are encoded by the Artis zee/zeego applications.

4.2.2.3.1.3.2 Specialized Information Object Definitions

The DICOM images sent by Artis zee/zeego DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements, which have to be discarded by a DICOM system when modifying the image.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

4.2.2.3.1.3.3 Data Dictionary of applied private IOD Attributes

Please refer to "Standard Extended/Specialized/Private SOP Classes" in the Annex for a list of possible private IOD attributes.

4.2.2.3.1.4 SOP specific Conformance - Request Commitment

Storage Commitment is supported for all the SOP Classes detailed in Chapter “Table 1 - Network Services” section “Workflow Management”.

The Referenced Study Component Sequence is not supported.

Storage Media File-Set ID and UID Attributes will not be supported in the commitment request (N-ACTION primitive) invoked by the Storage Commitment SCU.

4.2.2.4 Association Acceptance Policy

4.2.2.4.1 Activity – Update Flag Information

4.2.2.4.1.1 Description and Sequencing of Activity

After sending a Storage Commitment Request the Artis zee/zeego either waits on the same association or, being configured to receive response on a separate association, closes the association and waits for an association request from the Storage Commitment SCP that wants to send the results.

Any incoming Notification will be checked for validity, that is, if the related Transaction UID is still part of the Pending Request Queue.

If the Notification is valid the related Instances are marked with the reported status. The over-all Commit Status of the higher Information Entities in the Artis zee/zeego database is derived from propagation of the States of all sub-ordinate Image entities included in a study.

The Status Flags directly affected by Storage Commitment results and indicated in the different entities of the Patient Browser list can be one of

- "AC" or "SC" - Successful Commitment, "A" means archived to configured Archive destination, whereas "S" means sent to any other destination.
- "Af" of "Sf" - Commitment failed.
- "A?" or "S?" - Commitment request is sent, response is pending.

In case of failure the user has to repeat the transfer of images to the Archive destination. Another Storage Commitment will be performed after sending is completed successfully.

4.2.2.4.1.2 Accepted Presentation Context

The Artis zee/zeego DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 8 - Presentation Context Table "Update Flag Information"

Presentation Context Table – "Update Flag Information"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
1.2.840.10008.1.20.1 Storage Commitment Push Model	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.2.4.1.3 SOP specific Conformance

If the Commitment response (N-EVENT-REPORT) received has the status of "complete - failure exists", the transaction is marked as failed, else the transaction is marked as "completed". In both cases, a message is shown to the user.

The related status flags are set for the committed images in the local database.

The Artis zee/zeego DICOM application will not support the Storage Media File Set ID attributes.

4.2.3 Storage SCP AE Specification

4.2.3.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” Sections “Transfer” on page 2.

4.2.3.2 Association Policies

4.2.3.2.1 General

The Artis zee/zeego DICOM application will accept any number of verification or storage SOP classes that are referred to above. There is no limit on the number of presentation contexts accepted except for the DICOM limit. In the event that the Siemens DICOM application runs out of resources, it will reject the association request.

When "trusted host functionality" is enabled Artis zee/zeego will only accept Associations from known hosts with a known AET. Hosts and AETs have to be entered in "Local Service" by a Siemens CSE.

The default PDU size used will be 32 KB.

4.2.3.2.2 Number of Associations

The Siemens Artis zee/zeego DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.3.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.3.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.3.3 Association Initiation Policy

If the result from a previously accepted Storage Commitment request is evaluated, the Artis zee/zeego DICOM application attempts to initiate a new association for

- DIMSE N-EVENT-REPORT for sending commitment result from a previous request.

4.2.3.3.1 Activity - Return commitment result

When Artis zee/zeego Storage SCP AE received a Storage Commitment request it tries to send the response back on the same association. When the association is not open anymore it will initiate an association to send the storage commitment response (N-EVENT-REPORT) to the SCU.

4.2.3.3.1.1 Proposed Presentation Context

The Artis zee/zeego DICOM application will propose Storage SCP Presentation Contexts for returning Storage Commitment results as shown in the following table:

Table 9 - Presentation Context Table "Return Commitment Result"

Presentation Context Table – “Return Commitment Result”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Storage Commitment SOP Class as detailed in “Table 1 - Network Services” section “Workflow Management”.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.3.1.2 SOP Specific Conformance

Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage SCP.

4.2.3.4 Association Acceptance Policy

The Artis zee/zeego DICOM application attempts to accept a new association for

- DIMSE C-ECHO for incoming Verification requests
- DIMSE C-STORE for external image senders request storage of instances
- DIMSE N-ACTION for external systems requesting storage commitment
- DIMSE N-EVENT-REPORT for receiving commitment result from a previous request

4.2.3.4.1 Activity – Save to local disk

4.2.3.4.1.1 Description and Sequencing of Activity

The Artis zee/zeego DICOM application will accept an association and will receive SOP Instances according to the listed presentation contexts on that association and will store the images to the local hard disk if the conformance check is performed successfully.

Upon successful receiving a C-STORE-RQ, the Artis zee/zeego DICOM receiver performs a plausibility test on the received image and available system resources. If this test succeeds, it returns the Status SUCCESS, otherwise one of the following status codes is returned and the association is aborted:

Table 10 - Status codes "Save to local disk"

Code	Meaning
A700	Refused: This error status indicates a lack of Resources (e.g. not enough disk space) on the Artis zee/zeego modality.
A900	Invalid Dataset: An error occurred while processing the image, which makes it impossible to proceed. The image will not be stored and the association is aborted.
0110	Processing Error: An error occurred while processing the image, which makes it impossible to proceed. Association is aborted.

Note: The image will be saved after sending the response. If during this operation an error occurs, the association will be aborted. This implies that a C-STORE-RSP with status SUCCESS does not mean that the image was successfully stored into the database.

4.2.3.4.1.2 Accepted Presentation Context

The Artis zee/zeego DICOM application will accept Presentation Contexts as shown in the following table:

Table 11 - Presentation Context Table "Save to local disk"

Presentation Context Table – “Save to local disk”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Any image SOP Class detailed in “Table 1 - Network Services” section „Transfer (Image SOP Class)“.	JPEG Lossy Extended JPEG Lossless, Process 14 (selection value 1) JPEG Lossy Baseline (Process 1) Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.4.51 1.2.840.10008.1.2.4.70 1.2.840.10008.1.2.4.50 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Any non-image SOP Class detailed in “Table 1 - Network Services” section „Transfer (Non-image SOP Class)“.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None
Private SOP Class as detailed in Chapter “Table 1 - Network Services” section „Transfer (Private SOP Class)“.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.4.1.3 SOP specific Conformance

The Artis zee/zeego application conforms to the Full Storage Service Class at Level 2.

Any Explicit VR Transfer Syntax is preferred to be used by the Storage SCU when sending Composite Image Instances to the Artis zee/zeego DICOM application.

If an image instance is received that is identified by a SOP Instance UID which is already used by an Instance stored in database then the actual received image will be discarded. The existing Instance is not superseded.

The order of preference in accepting Transfer Syntaxes within Presentation Contexts or Presentation Contexts with single Transfer Syntaxes is:

Table 12 - Order of Preference Transfer Syntax

Order	DICOM Transfer Syntax
1	JPEG Lossy Extended
2	JPEG Lossless Non-hierarchical
3	JPEG Lossy Baseline
4	RLE Lossless
5	Explicit VR Little Endian
6	Implicit VR Little Endian

Artis zee/zeego DICOM application will decompress the image before storing it into the database.

The following sections will differentiate the attribute contents required for Image Viewing. The Artis zee/zeego DICOM application supports more formats for Storage of Images than for Viewing.

The Artis zee/zeego viewer supports only XA-Images for display.

Image Pixel Attribute Acceptance Criterion for Grayscale Images

The Artis zee/zeego Viewing application accepts MONOCHROME2 photometric interpretation pixel format and graphic overlay with unsigned integer and 8 or 16 bits allocated. Accepted values:

Pixel plane

- Samples per Pixel (attribute 0028,0002) = 1
- Photometric Interpretation (attribute 0028,0004) = "MONOCHROME2"
- Only Aspect Ratio 1:1 is supported
- Pixel Representation (attribute 0028,0103) = 0
- Bits Allocated (attribute 0028,0100) = 8, 16
- Bits Stored (attribute 0028,0101) = 8, 10, 12
- High Bit (attribute 0028,0102) = 7, 9, 11
- Rows/Columns = 512, 1024 and all formats internally generated (see Supported Matrix Sizes of Artis zee/zeego).

Overlay plane “embedded”

- Overlay Type (attribute 60xx,0040) = "G"
- Bits Allocated (attribute 60xx,0100) = 16
- Bit Position (attribute 60xx,0102) = 12, 13, 14, 15

Graphic Overlay will be shifted to fill Overlay Planes from Bit 12 and consecutive.

Overlay plane “explicit”

- Overlay Type (attribute 60xx,0040) = "G"
- Bits Allocated (attribute 60xx,0100) = 1
- Bit Position (attribute 60xx,0102) = 0
- Overlay Data (attribute 60xx,3000) = supported

For Modality LUT, both the linear LUT (Rescale Slope/Intercept) and the Modality LUT Sequence are supported and considered when pixel data is displayed. However there are two limitations. The Modality LUT Sequence will be ignored in the following cases:

- 8-Bit signed pixels
- the pixel format is changed by the Modality LUT (e.g. 8bit -> 16bit)

If the Modality LUT Sequence contains multiple LUTs, then only the first one is used.

For VOI LUT, both the linear LUT (Window Center/Width) and the VOI LUT Sequence are supported (VOI LUT Sequence with 8 or 16 bit LUT data)

But if both, a VOI LUT Sequence and a linear Modality LUT, are specified within one image, then the value for Rescale Slope is restricted to 1.

If the VOI LUT Sequence contains multiple LUTs, then only the first one is used by default. The other VOI LUTs are selectable.

4.2.3.4.2 Activity – Evaluate Commit Request

4.2.3.4.2.1 Description and Sequencing of Activity

When receiving a Storage Commitment request the Artis zee/zeego DICOM application will perform the necessary steps to check the received list Instances against the local database.

4.2.3.4.2.2 Accepted Presentation Context

The Artis zee/zeego DICOM application will accept Storage Commitment Presentation Contexts as shown in the following table:

Table 13 - Presentation Context Table "Evaluate Commit Request"

Presentation Context Table – “Evaluate Commit Request”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
Storage Commitment SOP Class detailed in “Table 1 - Network Services” section “Workflow Management”.	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCP	None

4.2.3.4.2.3 SOP specific Conformance

The Artis zee/zeego Storage SCP AE will return success for images that are stored in the local database and failure for images that are not. However, the committed images can later be deleted by the user at the Artis zee/zeego without notice!

Note: Storage Media File-Set ID and UID Attributes will not be supported in the N-EVENT-REPORT primitive invoked by the Storage Commitment SCP.

4.2.4 Query/Retrieve SCU Specification

4.2.4.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section „Query/Retrieve“ in the “Conformance Statement Overview”.

4.2.4.2 Association Policies

4.2.4.2.1 General

With the "Search..." function the query data can be entered and the DICOM query/retrieve application is initiated. An initial query request will be sent out to one remote node that can be selected from a list of configured Query Providers. Depending on the replies to the initial request, sub-sequent query requests are issued to gather further data for lower information level entities. The results compiled from the response data will be displayed to the user. Upon request (Import), the retrieval of selected items is initiated.

The default PDU size used will be 32KB.

4.2.4.2.2 Number of Associations

The Artis zee/zeego DICOM application initiates several associations at a time.

For Query it initiates a new association to the remote node and issues the C-FIND request to retrieve all the requested patient and study information matching the search criteria. The Artis zee/zeego initiates in parallel a second association to the destination node to query for all the series information for each study’s information returned on the first association.

For the Retrieve request (C-MOVE) only one association is initiated per destination.

4.2.4.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.4.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.4.3 Association Initiation Policy

The Artis zee/zeego DICOM application will request associations for the following DIMSE-C operations as SCU:

Table 14 - Supported DIMSE-C Operations - Query/Retrieve SCU

Supported DIMSE operations	Cancel Request supported
C-FIND	yes
C-MOVE	n. a.

Extended negotiation (relational query) is not supported for the above listed services.

4.2.4.3.1 Activity – Search for images (Search…)

4.2.4.3.1.1 Description and Sequencing of Activity

The associated activity is to fill out a query form with search data and pass it as query to the network application which issues a C-FIND over a previously built association. The remote SCP will respond with related data-entries that will be passed to a browser application. If needed, further associations are opened for querying data from sub-sequent entities. When data transfer is finished, each association is closed.

If the C-FIND Response from the remote Application contains an error status, the association is aborted.

4.2.4.3.1.2 Proposed Presentation Contexts

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 15 - Presentation Context Table "Search..."

Presentation Context Table - “Search…”					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Patient/Study Only Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Within the DICOM network configuration it is configurable which of the two query models (or both) are to be used by the Artis zee/zeego DICOM Query SCU application for each node. If both Abstract Syntaxes are configured, the Find SCU will use the Patient Root Model only for C-FIND requests on PATIENT level. For all other levels it will use the Study Root model.

4.2.4.3.1.3 SOP Specific Conformance

The Artis zee/zeego DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The interactive querying of attributes on IMAGE level is not supported by the Query SCU, hence retrieval of individual Objects is possible. The following table describes the search keys for the different query models that the SCU supports. Matching is either wildcard, which means that the user can supply a string containing wildcards, or universal, which means that the attribute is requested as return value.

Table 16 - C-FIND RQ Search Keys

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Patient Level[c]					
Patient Name	(0010,0010)	R	Wildcard[d]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard[d]	Enter value	yes
Patient’s Birth Date	(0010,0030)	O	Single value	Enter value	yes

[c] Patient Root Information Model only
[d] Always a “*” is appended to the user-supplied string

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Patient's Sex	(0010,0040)	O	Single value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal(Null)	--	yes[e]
Number of Patient related Series	(0020,1202)	O	Universal(Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal(Null)	--	no
Study Level					
Patient Name[f]	(0010,0010)	R	Wildcard[d]	Enter value	yes
Patient ID	(0010,0020)	U / R	Wildcard[d]	Enter value	yes
Patient's Birth Date[f]	(0010,0030)	O	Single value	Enter value	yes
Patient's Sex[f]	(0010,0040)	O	Single value	Enter value	yes
Study Instance UID	(0020,000D)	U	Single value	Enter value	yes
Study ID	(0020,0010)	R	Wildcard[d]	Enter value	yes
Study Date	(0008,0020)	R	Range	Enter value[g]	yes
Study Time	(0008,0030)	R	Range	Enter value	yes
Accession Number	(0008,0050)	R	Wildcard	Enter value	yes
Study Description	(0008,1030)	O	Wildcard[d]	Enter value	yes
Referring Physician's Name	(0008,0090)	O	Wildcard[d]	Enter value	yes
Name of Physician Reading Study	(0008,1060)	O	Wildcard[d]	Enter value	yes
Modalities in Study	(0008,0061)	O	Single Value	Enter value	yes
Number of Patient related Studies	(0020,1200)	O	Universal(Null)	--	no
Number of Patient related Series	(0020,1202)	O	Universal(Null)	--	no
Number of Patient related Instances	(0020,1204)	O	Universal(Null)	--	no
Number of Study related Series	(0020,1206)	O	Universal(Null)	--	yes[h]
Number of Study related Instances	(0020,1208)	O	Universal(Null)	--	no
Series Level					
Series Instance UID	(0020,000E)	U	Single Value	Enter value	yes
Series Number	(0020,0011)	R	Single Value	Enter value	yes
Modality	(0008,0060)	R	Single Value	Enter value	yes
Series Date	(0008,0021)	O	Universal(Null)	--	yes
Series Time	(0008,0031)	O	Universal(Null)	--	yes
Series Description	(0008,103E)	O	Wildcard[d]	Enter value	yes
Body Part Examined	(0018,0015)	O	Single Value	Enter value	yes
Performing Physician's Name	(0008,1050)	O	Wildcard[d]	Enter value	yes
Request Attributes Sequence	(0040,0275)	O	--	--	yes
>Requested Procedure ID	(0040,1001)	O	Wildcard[d]	Enter value	yes
>Scheduled Procedure Step ID	(0040,0009)	O	Wildcard[d]	Enter value	yes
Performed Procedure Step Start Date	(0040,0244)	O	Range	Enter value	yes
Performed Procedure Step Start Time	(0040,0245)	O	Range	Enter value	yes
Number of Series related Instances	(0020,1209)	O	Universal(Null)	--	yes
Instance Availability	(0008,0056)	O	Universal(Null)		
Image Level					
SOP Instance UID	(0008,0018)	U	Single Value	--	no
Instance Number	(0020,0013)	R	Universal(Null)	--	yes
SOP Class UID	(0008,0016)	O	Universal(Null)	--	no
Image Comments	(0020,4000)	O	Universal(Null)	--	yes
Number of Frames	(0028,0008)	O	Universal(Null)	--	yes

[e] Implicitly visualized in the UI if no study and series search attributes have been entered
[f] Study Root Information Model only
[g] Date range also possible
[h] Implicitly if no series search attributes have been entered

Attribute Name	Tag	Type	Matching	User Input	Return Value Display
Content Date	(0008,0023)	O	Universal(Null)	--	yes
Content Time	(0008,0033)	O	Universal(Null)	--	yes

U = Unique Key, **R** = Required Key, **O** = Optional Key, **-** = not supported or applicable

The Artis zee/zeego Search application supports a

- DIMSE C-FIND-CANCEL

if the user wishes to cancel a running Query request via the Artis zee/zeego user interface ("Cancel" button while a "Search…" is active).

The Find SCU interprets following status codes:

Table 17 - Status Codes "Search..."

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.4.3.2 Activity – Retrieve Images (Import…)

4.2.4.3.2.1 Description and Sequencing of Activity

When selecting a data entry in the Query UI and activating the "Import" function, a retrieval request is passed to the Artis zee/zeego DICOM application which issues a C-MOVE service according to the Patient Root or Study Root query model. (The Storage Service Class Conformance Statement describes the C-STORE service, which is generated by processing the C-MOVE service.)

The received image data are processed as described in the storage class SCP descriptions.

The Artis zee/zeego DICOM application will always insert the own Storage SCP AE as "Move Destination".

4.2.4.3.2.2 Proposed Presentation Contexts

The Artis zee/zeego Server DICOM application will propose Presentation Contexts as shown in the following table:

Table 18 - Presentation Context Table "Import..."

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Query/Retrieve Model Patient Root – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Study Root – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None
Query/Retrieve Model Patient/Study Only – MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCU	None

Note: C-MOVE Extended Negotiation will be not supported by the SCU.

4.2.4.3.2.3 SOP Specific Conformance

All required keys will be provided in the retrieve request identifier, as defined in DICOM Standard.

The Move SCU interprets following status codes:

Table 19 - C-MOVE RSP Status Codes

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	Move destination unknown	A801	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.4.4 Association Acceptance Policy

See next section “Query/Retrieve SCP AE Specification”.

4.2.5 Query/Retrieve SCP Specification

4.2.5.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section „Query/Retrieve“ in the “Conformance Statement Overview”.

4.2.5.2 Association Policies

4.2.5.2.1 General

When "trusted host" functionality is enabled Artis zee/zeego will only accept Associations from known hosts with a known AET. Hosts and AETs have to be entered in "Local Service" by a Siemens CSE.

The default PDU size used will be 32KB.

4.2.5.2.2 Number of Associations

The Siemens Artis zee/zeego DICOM application is able to accept multiple associations at a time. It can handle up to 10 associations in parallel.

The number of simultaneous DICOM associations can be configured via the Service-UI. The dialog can be found in "Configuration / DICOM / General".

4.2.5.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.5.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information”.

4.2.5.3 Association Initiation Policy

See previous section “Query/Retrieve SCU AE Specification”.

4.2.5.4 Association Acceptance Policy

The Artis zee/zeego DICOM application will accept associations for the following DIMSE-C operations as SCP:

- C-FIND
- C-GET
- C-MOVE
- C-FIND-CANCEL
- C-GET-CANCEL
- C-MOVE-CANCEL

Extended negotiation - which is relational query or retrieve - is not supported for the above listed services. The Artis zee/zeego DICOM application does support multiple C-FIND requests over the same association, while multiple C-MOVE or C-GET operations are not supported over the same association.

4.2.5.4.1 Activity - Process Search Requests

4.2.5.4.1.1 Description and Sequencing of Activity

The Query SCP AE will respond to incoming query requests from a SCU with the query model Patient Root, Study Root and Patient/Study Only. Relational retrieve operation is not supported. The content records of the local database are used to match the incoming query keys and fill the related return keys. With a C-FIND-CANCEL request the running query can be canceled at any time.

Multiple C-FIND requests over the same association are supported.

4.2.5.4.1.2 Accepted Presentation Contexts

The Artis zee/zeego DICOM application will accept Presentation Contexts as shown in the following table:

Table 20 - Presentation Context Table "Process Search Requests"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.1.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/Retrieve Model - FIND	1.2.840.10008.5.1.4.1.2.3.1	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.1.3 SOP Specific Conformance

The Artis zee/zeego DICOM Query/Retrieve SCP supports hierarchical queries for all mandatory and optional search keys.

The syntactical component structure of the attribute (0010,0010) Patients Name is defined as follows (see [DICOM], Part 5, Definition of PN, Person Name):

<single byte group> =<ideographic group>=<phonetic group>

The Query/Retrieve SCP replies to queries for “Patient Name” as follows:

1. Matching of Patients Name attribute (0010, 0010) is done case-insensitive.
2. If a search string matches the complete value of a Patient’s Name in the database, a match will be returned.
3. If a search string matches an individual group (single byte, ideographic or phonetic) of a Patient’s Name in the database, a match will be returned.
4. If a search string matches two consecutive groups of a data base object’s Patients Name, a match will be returned.
5. Redundant group separators “=” or component separators “^” are treated as insignificant for matching.
6. Leading and trailing blanks within a component or a group of Patient’s Name are treated as insignificant for matching.

Except for attribute Patient’s Name (0010,0010) any queries for text string attributes will be treated case-sensitive.

The Find SCP will not differentiate "?" and "*", thus "?abc*" will be treated as "*abc*".

If the value for the patient-level unique key "Patient ID" is not known, it will be returned with zero length. The attribute “Image Comments” will not be included in the C-FIND-RSP, if it is not set in the DB, even if it was requested as return key in the related C-FIND-RQ.

Usage of Storage Media File-Set ID, Retrieve AE Title with C-FIND-RSP message:

- The Storage Media File-Set ID - if available - can be returned at Study/Series/Image Level. Only on Image Level, the values of ONLINE, NEARLINE or OFFLINE are returned to indicate the Storage Location of the related Instance.
- The Retrieve AE Title - if available - can only be returned at Image Level (for Patient Root and Study Root models) or Study Level (for Patient/Study Only model).

Relational Queries are not supported.

A remote DICOM AE can cancel the running query by sending a C-FIND-CANCEL. Matches are possibly continuing (more C-FIND response with status PENDING) until the cancel operation takes effect and query matching has completed.

The supported attributes on the various query levels of the three supported information models are listed in the following table.

Table 21 - Query/Retrieve SCP supported attributes

Attribute Name	Tag	PR	SR	PSo	Matching
Patient Level (PR or PSo) or Study Level (SR)					
Patient Name	(0010,0010)	R	R	R	Single value, Wildcard, universal
Patient ID	(0010,0020)	U	R	U	Single Value, Wildcard, universal
Patient's Birth Date	(0010,0030)	O	O	O	Single Value, Range, universal
Patient's Birth Time	(0010,0032)	O	O	O	Single Value, Range, universal
Patient's Sex	(0010,0040)	O	O	O	Single Value, Wildcard, universal
Ethnic Group	(0010,2160)	O	-	O	Single Value, Wildcard, universal
Patient Comments	(0010,4000)	O	O	O	Wildcard, universal
Number of Patient related Studies	(0020,1200)	O	O	O	universal
Number of Patient related Series	(0020,1202)	O	O	O	universal
Number of Patient related Instances	(0020,1204)	O	O	O	universal
Study Level					
Study Instance UID	(0020,000D)	U	U	U	Single Value, List of UIDs
Study ID	(0020,0010)	R	R	R	Single Value, Wildcard, universal
Study Date	(0008,0020)	R	R	R	Single Value, Range, universal
Study Time	(0008,0030)	R	R	R	Single Value, Range, universal
Accession Number	(0008,0050)	R	R	R	Single Value, Wildcard, universal
Referring Physician's Name	(0008,0090)	O	O	O	Single Value, Wildcard, universal
Study Description	(0008,1030)	O	O	O	Single Value, Wildcard, universal
Admitting Diagnosis Description	(0008,1080)	O	O	O	Single Value, Wildcard, universal
Patient's Age	(0010,1010)	O	O	O	Single Value, Wildcard, universal
Patient's Size	(0010,1020)	O	O	O	Single Value, universal
Patient's Weight	(0010,1030)	O	O	O	Single Value, universal
Occupation	(0010,2180)	O	O	O	Single Value, Wildcard, universal
Additional Patient History	(0010,21B0)	O	O	O	Wildcard, universal
Name of Physician reading the Study	(0008,1060)	O	O	O	Single Value, Wildcard, universal
Modalities in Study	(0008,0061)	O	O	O	Multiple values, universal
Number of Study Related Series	(0020,1206)	O	O	O	universal
Number of Study Related Instances	(0020,1208)	O	O	O	universal
Series Level					
Series Instance UID	(0020,000E)	U	U	-	Single Value, List of UIDs
Series Number	(0020,0011)	R	R	-	Single Value, universal
Modality	(0008,0060)	R	R	-	Single Value, Wildcard, universal
Laterality	(0020,0060)	O	O	-	Single Value, Wildcard, universal
Body Part Examined	(0018,0015)	O	O	-	Single Value, Wildcard, universal
Patient Position	(0018,5100)	O	O	-	Single Value, Wildcard, universal
Smallest Pixel Value in Series	(0028,0108)	O	O	-	Single Value, universal
Largest Pixel Value in Series	(0028,0109)	O	O	-	Single Value, universal
Protocol Name	(0018,1030)	O	O	-	Single Value, Wildcard, universal
Series Date	(0008,0021)	O	O	-	Single Value, Range, universal
Series Time	(0008,0031)	O	O	-	Single Value, Range, universal
Series Description	(0008,103E)	O	O	-	Single Value, Wildcard, universal
Operator's Name	(0008,1070)	O	O	-	Single Value, Wildcard, universal
Performing Physician's name	(0008,1050)	O	O	-	Single Value, Wildcard, universal
Performed Procedure Step Start Date	(0040,0244)	O	O	-	universal
Performed Procedure Step Start Time	(0040,0245)	O	O	-	universal
Number of Series related Instances	(0020,1209)	O	O	-	universal
Image or SR Document Level					
SOP Instance UID	(0008,0018)	U	U	-	Single Value, List of UIDs
Image Number	(0020,0013)	R	R	-	Single Value, universal

Attribute Name	Tag	PR	SR	PSo	Matching
Content Date	(0008,0023)	O	O	-	Single Value, Range, universal
Content Time	(0008,0033)	O	O	-	Single Value, Range, universal
Modality	(0008,0060)	O	O	-	Single Value, Wildcard, universal
Image Comments	(0020,4000)	O	O	-	universal
Referenced Request Sequence	(0040,A370)	O	O	-	Sequence matching
>Accession Number	((0008,0050)	O	O	-	Single value, universal
>Requested Procedure ID	(0040,1000)	O	O	-	Single value, universal
Concept Name Code Sequence	(0040,A043)	O	O	-	Sequence matching
>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal
Template Identifier	(0040,DB00)	O	O	-	Single Value, Wildcard, universal
Completion Flag	(0040,A491)	O	O	-	Single Value, Wildcard, universal
Verification Flag	(0040,A493)	O	O	-	Single Value, Wildcard, universal
Verifying Observer Sequence	(0040,A073)	O	O	-	Sequence matching
>Verifying Organization	(0040,A027)	O	O	-	Single Value, Wildcard, universal
>Verifying Date Time	(0040,A030)	O	O	-	Single Value, Range, universal
>Verifying Observer Name	(0040,A075)	O	O	-	Single Value, Wildcard, universal
>Verifying Observer Identification Code Sequence	(0040,A088)	O	O	-	Sequence matching
>>Code Value	(0008,0100)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Designator	(0008,0102)	O	O	-	Single Value, Wildcard, universal
>>Coding Scheme Version	(0008,0103)	O	O	-	Single Value, Wildcard, universal
>>Code Meaning	(0008,0104)	O	O	-	Single Value, Wildcard, universal

PR = Patient Root Model, **SR** = Study Root Model, **PSo** = Patient/Study Only Model
U = Unique Key, **R** = Required Key, **O** = Optional Key, **-** = not supported or applicable

The “Process Search Requests” activity can return the following status codes:

Table 22 - Status Codes Process Search Request

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.5.4.2 Activity - Process Retrieve Requests

4.2.5.4.2.1 Description and Sequencing of Activity

The associated activity is to respond to retrieve requests initiated from a foreign SCU. Relational retrieve operation is not supported.

Multiple C-GET or C-MOVE requests over the same association are not supported.

4.2.5.4.2.1 Accepted Presentation Contexts

The Artis zee/zeego DICOM application will accept Presentation Contexts as shown in the following table:

Table 23 - Presentation Context Table "Process Retrieve Requests"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Patient Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.1.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.2.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/Retrieve Model - GET	1.2.840.10008.5.1.4.1.2.3.3	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Study Root Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None
Patient/Study Only Query/Retrieve Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2	Implicit VR Little Endian Explicit VR Big Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.2 1.2.840.10008.1.2.1	SCP	None

Note: C-FIND Extended Negotiation will not be supported.

The order of preference for accepting Transfer Syntaxes is: 1. Explicit VR Little Endian, 2. Explicit VR Big Endian, 3. Implicit VR Little Endian.

4.2.5.4.2.2 SOP Specific Conformance

Relational retrieve operation is not supported.

All unique keys have to be supplied according to the selected Query/Retrieve Level. The related tables in the C-FIND SCP section will give information about "U" marked key attributes.

The C-STORE can only be performed to AEs that are configured in the Artis zee/zeego.

The “Process Retrieve Requests” activity can return the following status codes:

Table 24 - Status Codes "Process Retrieve Requests"

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform sub operations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)

Service Status	Meaning	Error Codes	Related Fields
	Unable to process	C001	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

4.2.6 Print SCU Specification

4.2.6.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section “Print Management” in the “Conformance Statement Overview”.

4.2.6.2 Association Policies

4.2.6.2.1 General

Whenever a film-sheet is completely set up and printed by command or automated rule, the job is prepared for processing. As soon as the queue is ready to process the job, it is activated and worked according to the processing data. The Print application will initiate an association to the print destination and process the printing.

The default PDU size used will be 32KB.

4.2.6.2.2 Number of Associations

The Artis zee/zeego DICOM application initiates one association at a time for each different print device configured.

4.2.6.2.3 Asynchronous Nature

The Artis zee/zeego DICOM print application does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.6.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.6.3 Association Initiation Policy

Triggered by the Print job queue the Print Management SCU establishes an association by using the DICOM association services. An N-GET request determines the printer status prior to printing. If the printer status is “normal”, the print job is started.

After the last film is printed from queue, the Print application will leave open the association for another 60 seconds. If a new film job is ready for printing within this time-limit, the job will be immediately processed over the still open association. If there is no new job, the association is closed.

During the “idle-time” (no open association to printer) the Print application will issue a cyclic camera status request (using N-GET of the Printer SOP Class) every 5 minutes.

4.2.6.3.1 Activity - Print Film

4.2.6.3.1.1 Description and Sequencing of Activity

The film sheet is internally processed, converted to a Standard/1-1 page and then the page image is sent. Status is controlled by awaiting any N-EVENT message through the transfer until the last image or film-sheet is sent.

If the response from the remote application contains a status other than Success or Warning the association is aborted.

4.2.6.3.1.2 Proposed Presentation Context

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 25 - Presentation Context Table "Print Film"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Print Job SOP Class	1.2.840.10008.5.1.1.14	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Presentation LUT SOP Class	1.2.840.10008.5.1.1.23	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.6.3.1.3 SOP Specific Conformance

The Artis zee/zeego DICOM print management SCU conforms to the DICOM Basic Grayscale Print Management Meta SOP Class.

The application uses a setting platform to define the properties of the connected DICOM SCP, e.g.:

- maximum number of print jobs in the queue
- maximum number of print copies
- supported film sizes of the connected DICOM SCP
- supported film formats of the DICOM SCP
- lookup table definition.

The printing is only suspended in the case of a failure return status of the SCP.

Basic Film Session SOP Class

The Basic Film Session information object definition describes all the user-defined parameters, which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes that are printed on one hardcopy printer.

The Artis zee/zeego DICOM print management SCU supports the following DIMSE Service elements for the Basic Film Session SOP Class as SCU:

- N-CREATE
- N-DELETE

The Basic Film Session SOP Class N-CREATE-RQ (SCU) uses the following attributes:

Table 26 - Basic Film Session N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Number of Copies	(2000,0010)	U	"1"
Medium Type	(2000,0030)	U	BLUE FILM CLEAR FILM PAPER
Film Destination	(2000,0040)	U	MAGAZINE PROCESSOR

U = User Option

The number of copies sent to the DICOM Printer is always 1, the job is sent n times for n copies.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Session – see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Session

The N-DELETE-RQ on the Basic Film Session SOP Class is used to remove the complete Basic Film Session SOP Instance hierarchy.

The Basic Film Session SOP Class interprets the following status codes (from N-CREATE-RSP, N-DELETE-RSP messages):

Table 27 - Basic Film Session Status Codes

Service Status	Meaning	Error Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Memory allocation not supported	B600
	Film session printing is not supported	B601
	Film box does not contain image box (empty page)	B602
Success	Film belonging to the film session are accepted for printing	0000

Basic Film Box SOP Class

The Basic Film Box information object definition describes all the user-defined parameter of one film of the film session. The Basic Film Box information description defines the presentation parameters, which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

Supported Service Elements as SCU are:

- N-CREATE
- N-ACTION
- N-DELETE

The Basic Film Box SOP Class N-CREATE-RQ message uses the following attributes (the actual values for each attribute depend on DICOM printer configuration within the Artis zee/zeego DICOM print management SCU):

Table 28 - Basic Film Box N-CREATE attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Display Format	(2010,0010)	M	STANDARD\1,1
Referenced Film Session Sequence	(2010,0500)	M	n. a.
> Referenced SOP Class UID	(0008,1150)	M	1.2.840.10008.5.1.1.1
> Referenced SOP Instance UID	(0008,1155)	M	
Film Orientation	(2010,0040)	M	PORTRAIT
Film Size ID	(2010,0050)	M	8INX10IN, 10INX12IN, 10INX14IN, 11INX14IN,, 14INX14IN, 14INX17IN, 24CMX24CM, 24CMX30CM
Magnification Type	(2010,0060)	M	BILINEAR, CUBIC, NONE, REPLICATE
Max Density	(2010,0130)	U	> 0
Min Density	(2010,0120)	U	50 > value > 0
Illumination	(2010,015E)	U	> 0 Required if Presentation LUT is present.
Reflective Ambient Light	(2010,0160)	U	> 0 Required if Presentation LUT is present.
Referenced Presentation LUT Sequence	(2050,0500)	U	

M = Mandatory, **U** = User Option

The N-CREATE-RSP message from the Print SCP includes the Referenced Image Box Sequence with SOP Class/Instance UID pairs which will be kept internally and used for the subsequent Basic Image Box SOP Class N-SET-RQ messages.

When all Image Boxes (including parameters) for the film-sheet have been set, the DICOM print manager will issue a N-ACTION-RQ message with the SOP Instance UID of the Basic Film Box and the Action Type ID of 1.

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and used for later requests (e.g. N-DELETE-RQ) on the Basic Film Box - see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Basic Film Box

The Basic Film Box SOP Class interprets the following status codes:

Table 29 - Basic Film Box Status Codes

Service Status	Meaning	Error Codes
Failure	Unable to create print job, print queue is full	C601
	Image size is larger than images box size	C603
Warning	Film box does not contain image box (empty page)	B603
	Requested MinDensity or MaxDensity outside of Printer's operating range	B605

Service Status	Meaning	Error Codes
Success	Film accepted for printing	0000

Basic Grayscale Image Box SOP Class

The Basic Grayscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Grayscale Image Box information describes the presentation parameters and image pixel data, which apply to a single image of a sheet of film.

The Grayscale Image Box SOP Class uses only the N-SET-RQ with the following attributes:

Table 30 - Basic Grayscale Image Box N-SET attributes

Attribute Name	Tag	Usage SCU	Supported Values
Image Position	(2020,0010)	M	1
BASIC Grayscale Image Sequence	(2020,0110)	M	n. a.
> Samples per Pixel	(0028,0002)	M	1
> Photometric Interpretation	(0028,0004)	M	MONOCHROME2
> Rows	(0028,0010)	M	<Printer/Film config>
> Columns	(0028,0011)	M	<Printer/Film config>
> Pixel Aspect Ratio	(0028,0034)	M	(1:1)
> Bits Allocated	(0028,0100)	M	8, 16
> Bits Stored	(0028,0101)	M	8, 12
> High Bit	(0028,0102)	M	7, 11
> Pixel Representation	(0028,0103)	M	0
> Pixel Data	(7FE0,0010)	M	

M = Mandatory

The Grayscale Image Box SOP Class interpret the following status codes:

Table 31 - Basic Grayscale Image Box Status Codes

Service Status	Meaning	Error Codes
Failure	Image contains more pixel than printer can print in Image Box	C603
	Insufficient memory in printer to store the image	C605
Warning	Requested MinDensity or MaxDensity outside of Printer's operating range	B605
Success		0000

Presentation LUT SOP Class

The Presentation LUT tailors image hardcopy printing for specific modalities, applications and user preferences.

The output of the Presentation LUT is Presentation Values (P-Values). P-Values are approximately related to human perceptual response. They are intended to facilitate common input for hardcopy. P-Values are intended to be independent of the specific class or characteristics of the hardcopy device.

The Presentation LUT SOP Class uses only the N-CREATE-RQ with the following attributes:

Table 32 - Presentation LUT N-CREATE attribute

Attribute Name	Tag	Usage SCU	Supported Values
Presentation LUT Shape	(2050,0020)	U	IDENTITY

U = User Option

The affected SOP Instance UID received with N-CREATE-RSP message will be kept internally and is used for later requests on the Basic Film Box (N-CREATE-RQ) and on the Presentation LUT (N-DELETE-RQ) - see below:

Attribute Name	Tag	Source of Information
Requested SOP Instance UID	(0000,1000) → (0000,1001)	Affected SOP Instance UID of N-CREATE-RSP on Presentation LUT

The Presentation LUT SOP Class interprets the following status codes:

Table 33 - Presentation LUT Status Codes

Service Status	Meaning	Codes
Success	Presentation LUT successfully created	0000
Warning	Requested MinDensity or MaxDensity outside of printer's operating range. The printer will use its respective minimum or maximum density value instead.	B605

Printer SOP Class

The Printer SOP Class allows to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronous way.

The following returned information is supported:

Table 34 - Used Printer N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

Table 35 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

Note: For a detailed description on how Artis zee/zeego reacts on different printer status messages, please refer to the Annex section “DICOM Print SCU - detailed status displays”.

Printer Job SOP Class

The Print Job SOP Class allows to monitor the execution of the print process.

The Artis zee/zeego DICOM Print Management application supports the optional N-EVENT-REPORT DIMSE Service to receive the changes of the Print Job Status in an asynchronous way.

It can receive Events from the Print SCP asynchronously:

- N-EVENT-REPORT

Note: The underlying *syngo* DICOM Print AE does not support receiving of N-EVENT-REPORT messages from camera during open print sessions. This is typically configurable in the camera setup.

The following information is supported:

Table 36 - Used Print Job N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Printing	2	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Done	3	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U
Failure	4	Execution Status Info	(2100,0030)	U
		Print Job ID	(2100,0010)	-- (Print Queue Management SOP Class not supported)
		Film Session Label	(2000,0050)	U
		Printer Name	(2110,0030)	U

U = User Option

Note: For a detailed description on how Artis zee/zeego reacts on different printer status messages, please refer to the Annex section “DICOM Print SCU - detailed status displays”.

4.2.6.3.2 Activity - Show Device Status

4.2.6.3.2.1 Description and Sequencing of Activity

With no printing activity ongoing (“idle time”), the Artis zee/zeego DICOM Print SCU application will cyclically request the printer status to update the related printer state in the Printing UI.

4.2.6.3.2.2 Proposed Presentation Context

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 37 - Presentation Context Table "Show Device Status"

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Ext. Neg.
Name	UID	Name List	UID List		
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

4.2.6.3.2.3 SOP Specific Conformance

The Printer SOP Class allows to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

The Print SCU AE application will cyclically “ask” the Printer (SCP) for its status synchronously:

- N-GET as SCU

The following information is supported:

Table 38 - Used Printer N-EVENT Report attributes

Event-type Name	Event	Attributes	Tag	Usage SCU
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U
Failure	3	Printer Status Info	(2110,0020)	U

U = User Option

Table 39 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes

Attribute Name	Tag	Usage SCP	Supported Values
Printer Status	(2110,0010)	M	NORMAL, FAILURE, WARNING
Printer Status Info	(2110,0020)	M	See tables in Annex for details.

M = Mandatory

Note: For a detailed description on how Artis zee/zeego reacts on different printer status messages, please refer to the Annex section “DICOM Print SCU - detailed status displays”.

4.2.6.4 Association Acceptance Policy

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4.2.7 Worklist SCU AE

4.2.7.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section „Workflow Management“ in the “Conformance Statement Overview”.

4.2.7.2 Association Policies

4.2.7.2.1 General

It is possible to configure a cyclic update of the modality Scheduler DB through a background worklist request with date/time and modality information.

In addition, the user can request worklist update with “Update Worklist”. No duplicate entries will be added in the Scheduler DB. Entries are uniquely identified by the Study Instance UID (0020,000D) for the Requested Procedure and the SPS ID (0040,009) in the SPS Sequence (0040,0100).

An interactive worklist query can be issued with search criteria entered in the patient based Query dialog from the patient browser..

The default PDU size used will be 32KB.

4.2.7.2.2 Number of Associations

The Artis zee/zeego DICOM application initiates one association at a time to query worklist entry data.

4.2.7.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.7.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.7.3 Association Initiation Policy

The Artis zee/zeego DICOM application will cyclically query the worklist provider and by request from the patient registration interface. It establishes an association by using the

- C-FIND with Worklist information model

It is possible to configure multiple worklist providers but only one can be active at a time. The active worklist provider can be selected in the user settings.

4.2.7.3.1 Activity - (cyclic) Update Worklist

4.2.7.3.1.1 Description and Sequencing of Activity

A network application will perform worklist queries with the C-FIND request at regular intervals. In addition it can be triggered by immediate request. The received worklist items will be compared with the contents of the local Scheduler DB. New items will be inserted into Scheduler DB.

After each broad-query, all Requested Procedures / Scheduled Procedure Steps that were canceled or rescheduled to another modality at the RIS will be automatically removed from the Scheduler DB if :

1. the Examination of this procedure has not been started or finished yet, and
2. the corresponding configuration item “Automatic removal of canceled/rescheduled Request” was checked in the Service UI under DICOM/HIS-RIS Node.

No automatic clean-up of the Scheduler DB is performed after a Patient-based Query since the worklist received - due to restricted search criteria - does not correspond to the list of all currently scheduled procedures for the modality.

4.2.7.3.1.2 Proposed Presentation Context

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 40 - Presentation Context “Update Worklist”

Presentation Context Table – “Update Flag Information”				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
1.2.840.10008.5.1.4.31 Modality Worklist Information Model - FIND	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.7.3.1.3 SOP Specific Conformance

- Search Key Attributes for the Worklist C-FIND

The Artis zee/zeego DICOM worklist SCU supports “broad worklist queries” with all required search keys. The following table describes the “broad query” search keys that the SCU supports.

Table 41 - Supported Broad Worklist Query Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Station AE Title *(It depends on user configuration (Options->Configuration-> Patient Registration) if the "own AET" is provided or not. Use the "HIS/RIS" tab card for configuration.)*	(0040,0001)	R	<own AET> or <zero length>
>Schedule Procedure Step Start Date *(It depends on user configuration (Options->Configuration-> Patient Registration) if Date range with a full time range or an interactive input dialog for date/time specification is used.)*	(0040,0002)	R	<config. Date>-<config. Date> or range from UI
>Schedule Procedure Step Start Time *(It depends on user configuration (Options->Configuration-> Patient Registration) if the actual Date with a full time range or an interactive input dialog for date/time specification is used.)*	(0040,0003)	R	00.00-235959.00 or range from UI
>Modality *(It depends on user configuration (Options->Configuration-> Patient Registration) if the " Modality" is provided or not. Use the "HIS/RIS" tab card for configuration.)*	(0008,0060)	R	<zero length> or <configured Modality>

R = Required

- Return Key Attributes of the Worklist C-FIND

The Artis zee/zeego DICOM Worklist SCU supports worklist queries with return key attributes of all types. The following table describes the return keys that the SCU supports.

An “x” in the **UI** column will indicate the attribute is displayed in the user interface. The display is influenced by the related configuration.

A tag in the **IOD** column will indicate that the related attribute is included into the SOP Instances of the IODs created during processing of this worklist request.

A tag in the **MPPS** column will indicate that the related attribute is included into the SOP Instances of the MPPS objects created during processing of this worklist request. (See also the tables “Attributes used for the Performed Procedure Step N-CREATE” and “Attributes used for the Performed Procedure Step N-SET”.)

Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
SOP Common					
Specific Character Set	(0008,0005)	1C	-	(0008,0005)	(0008,0005)
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	1			
>Modality	(0008,0060)	1	x	(0008,0060)	(0008,0060)
>Requested Contrast Agent	(0032,1070)	2C	x		
>Scheduled Station AE Title *(“Scheduled Station AE Title” is taken as default for “Performed Station AE Title”)*	(0040,0001)	1	x		(0040,0241)
>Scheduled Procedure Step Start Date	(0040,0002)	1	x		
>Scheduled Procedure Step Start Time	(0040,0003)	1	x		
>Scheduled Procedure Step End Date	(0040,0004)	3	-		
>Scheduled Procedure Step End Time	(0040,0005)	3	-		
>Scheduled Performing Physician’s Name *(“Scheduled Performing Physician’s Name” is taken as default for “Performing Physician’s Name”)*	(0040,0006)	1	x	(0008,1050)	(0008,1050)
>Scheduled Procedure Step Description *(“Scheduled Procedure Step Description” is taken as default for “Performed Procedure Step Description”)*	(0040,0007)	1C	x	(0040,0007) (0040,0254)	(0040,0007) (0040,0254)
>Scheduled Protocol Code Sequence *(universal Sequence Match)* *(“Scheduled Protocol Code Sequence” is taken as default for “Performed Protocol Code Sequence”)*	(0040,0008)	1C	-	(0040,0008) (0040,0260)	(0040,0008) (0040,0260)
>>Code Value	(0008,0100)	1C	x		
>>Coding Scheme Designator	(0008,0102)	1C	x		
>>Coding Scheme Version	(0008,0103)	3	x		
>>Code Meaning	(0008,0104)	3	x		
>Scheduled Procedure Step ID *(“Scheduled Procedure Step ID” is taken as default for “Performed Procedure Step ID”)*	(0040,0009)	1	x	(0040,0009) (0040,0253)	(0040,0009) (0040,0253)
>Scheduled Station Name	(0040,0010)	2	x		
>Scheduled Procedure Step Location *(“Scheduled Procedure Step Location” is taken as default for “Performed Location”)*	(0040,0011)	2	x		(0040,0243)
>Pre-Medication	(0040,0012)	2C	x		
>Scheduled Procedure Step Status	(0040,0020)	3	x		
>Comments on the Scheduled Procedure Step	(0040,0400)	3	-		
Requested Procedure					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	2	-	(0008,1110)	(0008,1110)
>Referenced SOP Class UID	(0008,1150)	1C	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Study Instance UID	(0020,000D)	1	-	(0020,000D)	(0020,000D)
Requested Procedure Description	(0032,1060)	1C	x	(0032,1060)	(0032,1060)
Requested Procedure Code Sequence *(universal Sequence Match)* *("Requested Procedure Code Sequence" is taken as default for "Procedure Code Sequence")*	(0032,1064)	1C	-	(0008,1032) (0032,1064)	(0008,1032)
>Code Value	(0008,0100)	1C	x		
>Coding Scheme Designator	(0008,0102)	1C	x		
>Coding Scheme Version	(0008,0103)	3	x		
>Code Meaning	(0008,0104)	3	x		
Requested Procedure ID *("Requested Procedure ID" is taken as default for "Study ID")*	(0040,1001)	1	x	(0040,1001) (0020,0010)	(0040,1001) (0020,0010)
Reason for the Requested Procedure	(0040,1002)	3	-	(0040,1002)	
Requested Procedure Priority	(0040,1003)	2	x		
Patient Transport Arrangements	(0040,1004)	2	-		
Requested Procedure Location	(0040,1005)	3	-		
Confidentiality Code	(0040,1008)	3	-		
Reporting Priority	(0040,1009)	3	-		
Names of intended Recipients of Results	(0040,1010)	3	-	(0008,1048)	
Requested Procedure Comments	(0040,1400)	3	x		
Imaging Service Request					
Accession Number	(0008,0050)	2	x	(0008,0050)	(0008,0050)
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Requesting Physician	(0032,1032)	2	x	(0032,1032) (0008,1048)	
Requesting Service	(0032,1033)	3	x	(0032,1033)	
Issuing Date of Imaging Service Request	(0040,2004)	3	-		
Issuing Time of Imaging Service Request	(0040,2005)	3	-		
Placer Order Number / Imaging Service Request *(Old tag (0040,2006) is retired and not used.)*	(0040,2016)	3	-		(0040,2016)
Filler Order Number / Imaging Service Request *(Old tag (0040,2007) is retired and not used.)*	(0040,2017)	3	-		(0040,2017)
Order entered by …	(0040,2008)	3	-		
Order Enterer's location	(0040,2009)	3	-		
Order Callback Phone Number	(0040,2010)	3	-		
Imaging Service Request Comments	(0040,2400)	3	x		
Visit Identification					
Institution Name	(0008,0080)	3	x	(0008,0080)	
Institution Address	(0008,0081)	3	-		
Institution Code Sequence *(universal Sequence Match)*	(0008,0082)	3	-		
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Admission ID	(0038,0010)	2	x		
Issuer of Admission ID	(0038,0011)	3	-		
Visit Status					
Visit Status ID	(0038,0008)	3	-		
Current Patient Location	(0038,0300)	2	x		
Patient's Institution Residence	(0038,0400)	3	-		
Visit Comments	(0038,4000)	3	-		

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Visit Relationship					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Sequence *(universal Sequence Match)*	(0008,1120)	2	-		(0008,1120)
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Visit Admission					
Referring Physician's Name	(0008,0090)	2	x	(0008,0090)	
Admitting Diagnosis Description	(0008,1080)	3	x	(0008,1080)	
Patient Identification					
Patient's Name	(0010,0010)	1	x	(0010,0010)	(0010,0010)
Patient ID	(0010,0020)	1	x	(0010,0020)	(0010,0020)
Issuer of Patient ID	(0010,0021)	3	-	(0010,0021)	
Other Patient IDs	(0010,1000)	3	x	(0010,1000)	
Other Patient Names	(0010,1001)	3	x	(0010,1001)	
Patient's Birth Name	(0010,1005)	3	-	(0010,1005)	
Patient's Mother's Birth Name	(0010,1060)	3	-	(0010,1060)	
Medical Record Locator	(0010,1090)	3	-	(0010,1090)	
Patient Demographic					
Patient's Birth Date	(0010,0030)	2	x	(0010,0030)	(0010,0030)
Patient's Birth Time	(0010,0032)	3	-	(0010,0032)	
Patient's Sex	(0010,0040)	2	x	(0010,0040)	(0010,0040)
Patient's Insurance Plan Code Sequence *(universal Sequence Match)*	(0010,0050)	3	-	(0010,0050)	
>Code Value	(0008,0100)	1C	-		
>Coding Scheme Designator	(0008,0102)	1C	-		
>Coding Scheme Version	(0008,0103)	3	-		
>Code Meaning	(0008,0104)	3	-		
Patient's Age	(0010,1010)	3	x	(0010,1010)	
Patient's Size	(0010,1020)	3	x	(0010,1020)	
Patient's Weight	(0010,1030)	2	x	(0010,1030)	
Patient's Address	(0010,1040)	3	x	(0010,1040)	
Military Rank	(0010,1080)	3	x	(0010,1080)	
Branch of Service	(0010,1081)	3	-	(0010,1081)	
Country of Residence	(0010,2150)	3	-	(0010,2150)	
Region of Residence	(0010,2152)	3	-	(0010,2152)	
Patient's Telephone Numbers	(0010,2154)	3	-	(0010,2154)	
Ethnic Group	(0010,2160)	3	x	(0010,2160)	
Occupation	(0010,2180)	3	-	(0010,2180)	
Patient's Religious Preference	(0010,21F0)	3	-	(0010,21F0)	
Patient Comments	(0010,4000)	3	x	(0010,4000)	
Patient Data Confidentiality Constraint Description	(0040,3001)	2	x	(0040,3001)	
Patient Medical					
Medical Alerts	(0010,2000)	2	x	(0010,2000)	
Contrast Allergies	(0010,2110)	2	x	(0010,2110)	
Pregnancy Status	(0010,21C0)	2	x	(0010,21C0)	
Smoking Status	(0010,21A0)	3	x	(0010,21A0)	
Last Menstrual Date	(0010,21D0)	3	x	(0010,21D0)	
Additional Patient History	(0010,21B0)	3	x	(0010,21B0)	

Attribute Name	Tag	Return Key Type	UI	IOD	MPPS
Special Needs	(0038,0050)	2	x	(0038,0050)	
Patient State	(0038,0500)	2	x	(0038,0500)	
Patient Relationship					
Referenced Study Sequence *(universal Sequence Match)*	(0008,1110)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Visit Sequence *(universal Sequence Match)*	(0008,1125)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		
Referenced Patient Alias Sequence *(universal Sequence Match)*	(0038,0004)	3	-		
>Referenced SOP Class UID	(0008,1150)	1C	-		
>Referenced SOP Instance UID	(0008,1155)	1C	-		

- The Worklist SCU interprets the following status codes:

Table 43 - Status Codes "Update Worklist"

Service Status	Meaning	Error Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

4.2.7.3.2 Activity - Get Worklist

4.2.7.3.2.1 Description and Sequencing of Activity

With "Get Worklist" in the patient based Worklist Query dialog, the entered attributes are used to form a worklist request identifier. The response data is used to fill the Patient Registration dialog. The response data are additionally placed in the Scheduler DB.

4.2.7.3.2.2 Proposed Presentation Context

This Activity will propose the same Presentation Context as with “Update Worklist”. Please see related table in section 4.2.7.3.1.2.

4.2.7.3.2.3 SOP Specific Conformance

The Artis zee/zeego DICOM worklist SCU supports “narrow worklist queries” with all required search keys. The following tables describe the “narrow query” search keys that the SCU supports.

Table 44 - Patient based "narrow query" Search Key Attributes

Attribute Name	Tag	Matching Key Type	Query Value
Scheduled Procedure Step			
Scheduled Procedure Step Sequence	(0040,0100)	R	
>Scheduled Performing Physician's Name	(0040,0006)	R	input from UI or <zero length>
Requested Procedure			
Requested Procedure ID	(0040,1001)	O	input from UI or <zero length>
Imaging Service Request			
Accession Number	(0008,0050)	O	input from UI or <zero length>
Referring Physician's Name	(0008,0090)	O	input from UI or <zero length>
Visit Status			
Current Patient Location	(0038,0300)	O	input from UI or <zero length>
Patient Identification			
Patient's Name	(0010,0010)	R	input from UI or <zero length>
Patient ID	(0010,0020)	R	input from UI or <zero length>

R = Required Key, **O** = Optional Key

The Return Key Attribute handling and supported Status Codes are identical to the "Update Worklist" activity. Please see 4.2.7.3.1.3 for details.

4.2.7.4 Association Acceptance Policy

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4.2.8 Modality PPS SCU AE

4.2.8.1 SOP Classes

For SOP Classes supported, please refer to “Table 1 - Network Services” section „Workflow Management“ in the “Conformance Statement Overview”.

4.2.8.2 Association Policies

4.2.8.2.1 General

The creation of MPPS Instance is done automatically by Artis zee/zeego whenever a patient is registered for image acquisition through the Patient Registration dialog.

Further updates on the MPPS data can be done interactively from the related MPPS user interface. The MPPS “Complete” or “Discontinued” states can be set from user interface.

The default PDU size used will be 32KB.

4.2.8.2.2 Number of Associations

The Artis zee/zeego DICOM application initiates one association at a time to create or set the MPPS instance.

4.2.8.2.3 Asynchronous Nature

The Artis zee/zeego DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

4.2.8.2.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

4.2.8.3 Association Initiation Policy

The Artis zee/zeego DICOM application will notify a RIS (MPPS Manager) about the status of a procedure while it is performed. It establishes an association by using the

- N-CREATE DIMSE according to the CREATE Modality Performed Procedure Step SOP Instance operation or a
- N-SET DIMSE to update the contents and state of the MPPS according to the SET Modality Performed Procedure Step Information operation.

It is possible to configure multiple MPPS providers but only one can be active at a time. The active MPPS provider can be selected in the user settings.

4.2.8.3.1 Activity - Patient registered

4.2.8.3.1.1 Description and Sequencing of Activity

A patient is registered by the Patient Registration “Exam” action. From this event the trigger to create a MPPS Instance is derived. The related Instance is then immediately communicated to the configured RIS system. An association is established and the MPPS Instance is sent.

4.2.8.3.1.2 Proposed Presentation Context

The Artis zee/zeego DICOM application will propose Presentation Contexts as shown in the following table:

Table 45 - Presentation Context "Patient Registered"

Presentation Context Table – "Update Flag Information"				
Abstract Syntax	Transfer Syntax		Role	Ext. Neg.
Description	Name List	UID List		
1.2.840.10008.3.1.2.3.3 Modality Performed Procedure Step	Explicit VR Little Endian Explicit VR Big Endian Implicit VR Little Endian	1.2.840.10008.1.2.1 1.2.840.10008.1.2.2 1.2.840.10008.1.2	SCU	None

4.2.8.3.1.3 SOP Specific Conformance

- Attributes for the Performed procedure Step N-CREATE

The Siemens Artis zee/zeego DICOM Modality Performed Procedure Step SCU informs the remote SCP when the examination of a scheduled procedure step will be performed (i.e. the patient is registered). The N-CREATE message is sent when the examination is started with successful registration of the patient data. The following table describes the supported attributes of a N-CREATE message.

Table 46 - Performed Procedure Step N-CREATE Attributes

Attribute Name	Tag	Type	Value
SOP Common			
Specific Character Set	(0008,0005)	1C	from MWL or created
Performed Procedure Step Relationship			
Scheduled Step Attribute Sequence	(0040,0270)	1	
>Study Instance UID	(0020,000D)	1	from MWL or created
>Referenced Study Sequence	(0008,1110)	2	from MWL or <zero length>
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Accession Number	(0008,0050)	2	from MWL or user input
>Placer Order Number/Imaging Service Request	(0040,2016)	3	from MWL or <zero length>
>Filler Order Number/Imaging Service Request	(0040,2017)	3	from MWL or <zero length>
>Requested Procedure ID	(0040,0001)	2	from MWL or user input
>Requested Procedure Description	(0032,1060)	2	from MWL or <zero length>
>Scheduled Procedure Step ID	(0040,0009)	2	from MWL or <zero length>
>Scheduled Procedure Step Description	(0040,0007)	2	from MWL or <zero length>
>Scheduled Protocol Code Sequence	(0040,0008)	2	from MWL or <zero length>
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	3	
>>Code Meaning	(0008,0104)	3	
Patient's Name	(0010,0010)	2	from MWL or user input
Patient ID	(0010,0020)	2	from MWL or user input
Patient's Birth Date	(0010,0030)	2	from MWL or user input
Patient's Sex	(0010,0040)	2	from MWL or user input
Referenced Patient Sequence	(0008,1120)	2	from MWL or <zero length>
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step ID	(0040,0253)	1	From SPS ID or created
Performed Station AE Title	(0040,0241)	1	own AE Title
Performed Station Name	(0040,0242)	2	own hostname
Performed Location	(0040,0243)	2	from SPS location or <zero length>
Performed Procedure Step Start Date	(0040,0244)	1	created
Performed Procedure Step Start Time	(0040,0245)	1	created
Performed Procedure Step Status	(0040,0252)	1	“IN PROGRESS”
Performed Procedure Step Description	(0040,0254)	2	from SPS Description or <zero length>
Performed Procedure Type Description	(0040,0255)	2	<zero length>
Procedure Code Sequence	(0008,1032)	2	from Requested Procedure Code or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	2	<zero length>
Performed Procedure Step End Time	(0040,0251)	2	<zero length>
Comments on the Performed Procedure Steps	(0040,0280)	3	<zero length>
Image Acquisition Results			
Modality	(0008,0060)	1	XA
Study ID	(0020,0010)	2	from Requested Procedure ID or created
Performed Protocol Code Sequence	(0040,0260)	2	from Scheduled Protocol Code Sequence or <zero length>
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	2	
>Performing Physician’s Name	(0008,1050)	2C	from MWL or user input
>Operator’s Name	(0008,1070)	2C	User input
>Series Instance UID	(0020,000E)	1C	created
>Series Description	(0008,103E)	2C	<zero length>
>Retrieve AE Title	(0008,0054)	2C	<zero length>
>Protocol Name	(0018,1030)	1C	from organ program
>Referenced Image Sequence	(0008,1140)	2C	<zero length>
>Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Anatomic Structure, Space or Region Sequence	(0008,2229)	3	<zero length>
Total Time of Fluoroscopy	(0040,0300)	3	<zero length>
Total Number of Exposures	(0040,0301)	3	<zero length>
Distance Source to Detector	(0018,1110)	3	<zero length>
Distance Source to Entrance	(0040,0306)	3	<zero length>
Entrance Dose	(0040,0302)	3	<zero length>
Entrance Dose in mGy	(0040,8302)	3	<zero length>
Exposed Area	(0040,0303)	3	<zero length>
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	<zero length>
Comments on Radiation Dose	(0040,0310)	3	<zero length>
Exposure Dose Sequence	(0040,030E)	3	<zero length>
Billing and Material Management Code			
Billing Procedure Step Sequence	(0040,0320)	3	<zero length>

Attribute Name	Tag	Type	Value
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	<zero length>
>Medium Type	(2000,0030)	3	<zero length>
>Film Size ID	(2010,0050)	3	<zero length>
Billing Supplies and Devices Sequence	(0040,0324)	3	
>Billing Item Sequence	(0040,0296)	3	<zero length>
>Quantity Sequence	(0040,0293)	3	
>>Quantity	(0040,0294)	3	<zero length>
>>Measuring Units Sequence	(0040,0295)	3	<zero length>

- The Performed Procedure Step SCU interprets the following N-CREATE status codes:

Table 47 - Status Codes "Patient Registered"

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure	0110
	No such attribute	0105
	Invalid attribute value	0106
	Duplicate SOP Instance	0111
	No such SOP Instance	0112
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute	0120
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance created	0000

4.2.8.3.2 Activity - MPPS Update

4.2.8.3.2.1 Description and Sequencing of Activity

With the MPPS UI the status of the MPPS Instance can be set to “COMPLETED” or “DISCONTINUED”. During performance of the procedure the status will remain “IN PROGRESS”.

4.2.8.3.2.2 Proposed Presentation Context

For "MPPS Update" the same Presentation Contexts as with “Patient registered” are proposed. Please see related table in section 4.2.8.3.1.2.

4.2.8.3.2.3 SOP Specific Conformance

- Attributes for the Performed procedure Step N-SET

The Siemens Artis zee/zeego DICOM Modality Performed Procedure Step SCU informs the remote SCP about the performed examination and its status. The N-SET message is sent after each acquisition (status "IN PROGRESS") and per finished examination (finished status “COMPLETED” or incomplete status “DISCONTINUED”). The following table describes the supported attributes of a N-SET message.

Table 48 - Performed Procedure Step N-SET Attributes

Attribute Name	Tag	Type	Value
Performed Procedure Step Information			
Performed Procedure Step Status	(0040,0252)	3	"IN PROGRESS" during procedure, “COMPLETED” or “DISCONTINUED” for final N-SET
Performed Procedure Step Description	(0040,0254)	3	from SPS Description or user input
Procedure Code Sequence	(0008,1032)	3	from Requested Procedure

Attribute Name	Tag	Type	Value
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Procedure Step End Date	(0040,0250)	1	created
Performed Procedure Step End Time	(0040,0251)	1	created
Comments on the Performed Procedure Steps	(0040,0280)	3	user input
Image Acquisition Results			
Performed Protocol Code Sequence	(0040,0260)	3	from Scheduled Protocol Code Sequence
>Code Value	(0008,0100)	1C	
>Coding Scheme Designator	(0008,0102)	1C	
>Coding Scheme Version	(0008,0103)	3	
>Code Meaning	(0008,0104)	3	
Performed Series Sequence	(0040,0340)	1	
>Performing Physician's Name	(0008,1050)	2C	from MWL or user input
>Protocol Name	(0018,1030)	1C	from related SOP Instance
>Operator's Name	(0008,1070)	2C	user input
>Series Instance UID	(0020,000E)	1C	from related SOP Instance
>Series Description	(0008,103E)	2C	from related SOP Instance
>Retrieve AE Title	(0008,0054)	2C	
>Referenced Image Sequence	(0008,1140)	2C	Series related SOP Instances as items
>>Referenced SOP Class UID	(0008,1150)	1C	
>>Referenced SOP Instance UID	(0008,1155)	1C	
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C	<zero length>
Radiation Dose			
Total Time of Fluoroscopy	(0040,0300)	3	
Total Number of Exposures	(0040,0301)	3	
Entrance Dose in mGy	(0040,8302)	3	accumulated over complete procedure step
Image and Fluoroscopy Area Dose Product	(0018,115E)	3	accumulated over complete procedure step (dGy*cm^2)
Exposure Dose Sequence	(0040,030E)	3	on item for each irradiation event (acquisition or fluoro)
>Radiation Mode	(0018,115A)	3	"PULSED"
>KVP	(0018,0060)	3	peak KV used for this event (KV)
>X-ray Tube Current in µA	(0018,8151)	3	tube current used for this event
>Exposure Time	(0018,1150)	3	time of x-ray in ms for this event
>Comments on Radiation Dose	(0040,0310)	3	additional acquisition specific information (Entrance Dose, Dose Area Product, X-Ray Filter, etc.) as text
Comments on Radiation Dose	(0040,0310)	3	user input
Billing and Material Management Code			
Film Consumption Sequence	(0040,0321)	3	
>Number of Films	(2100,0170)	3	
>Medium Type	(2000,0030)	3	
>Film Size ID	(2010,0050)	3	

- The Performed Procedure Step SCU interprets the following N-SET status codes:

Table 49 - Status Codes "MPPS Update"

Service Status	Meaning	Error Codes (0000.0900)
Failure	Processing Failure: Performed Procedure Step Object may no longer be updated.	0110
	No such attribute	0105
	Invalid attribute value	0106
	No such SOP Instance	0112
	Invalid Object instance	0117
	No such SOP Class	0118
	Class Instance conflict	0119
	Missing attribute value	0121
	Resource limitation	0213
Success	MPPS Instance set	0000

- Performed Procedure Step ID without MPPS option
  Handling of Performed Procedure Step ID in case

  - MPPS is not configured or
  - Unscheduled case

  The attribute “Performed Procedure Step ID” (0040,0235) will be encoded based on "YYYYMMDDHHMMSS". This date and time is based on the time when the first image is acquired. The "Performed Procedure Step ID" stays the same for all acquired or derived images as long as the patient is re-registered. A re-registered patient with a new study or new series within the existing study will get a newly assigned "Performed Procedure Step ID".

4.2.8.4 Association Acceptance Policy

n. a.

4.3 Network Interfaces

4.3.1 Physical Network Interface

The DICOM Interface of the Artis zee/zeego provides DICOM TCP/IP Network Communication Support and uses the TCP/IP protocol stack from the operating system. It uses the MergeCOM subroutine library. All available Ethernet interfaces are supported.

4.3.2 Additional Protocols

not applicable

4.4 Configuration

4.4.1 AE Title/Presentation Address Mapping

Local AE Titles

According to the DICOM Standard, the AET string can be up to 16 characters long and must not contain any extended characters, only 7-bit ASCII characters (excluding Control Characters).

Note: The current implementation of *syngo* does not allow Spaces and special characters (like &<> ") in the AE title string.

Change of the default AE Titles chosen by the system can be performed in the Service UI under “Configuration / DICOM / General” item - first page.

Table 50 - Default AET Characteristics

Application Entity	Default AE Title	TCP/IP Port
Verification SCU	STU_<hostname>	-
Verification SCP		104 (fixed)
Storage SCU		-
Storage SCP		104 (fixed)
Query/Retrieve SCU		-
Query/Retrieve SCP		104 (fixed)
Print SCU	PRI_<hostname>	-
Worklist SCU	HRI_<hostname>	-
MPPS SCU		-

Remote AE Titles

When "trusted host functionality" is enabled all external AE Titles have to be configured to be able to communicate with Artis zee/zeego.

For each remote AE the following data and capabilities can be configured:

Table 51 - Remote AE Configuration Items

Remote AE configuration item	Comment
Host Name	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of Artis zee/zeego.
TCP/IP address	As defined in the network domain. This has to be configured also for any DICOM AE that wishes to connect to SCP services of Artis zee/zeego.
Logical Name	Name for the AE used in the user interfaces of the Artis zee/zeego applications.
AE Title	AET, as provided by network administration
Port Number	Port Number, as provided by network administration
If **Storage** Service support is checked	
Transfer Syntax	Selection of uncompressed transfer Syntaxes supported by remote AE
Compression	Selection of additional compression Syntaxes supported for remote AE
Default Node	“first default”/”second default”/[“no default”] - activating this feature will show “Send to <logical name>” in the Transfer tool menu for quick access.
Preference Node	When checked, the remote AE will be assigned to a keyboard shortcut key.
Archive Node	When checked, sending to remote AET will set status of **a**(rchived), else **s**(ent) is indicated.
Default Archive	When checked, the remote AE will be listed as default archive in User interfaces.
Graphics in Pixel Data	When checked, the DICOM overlay will not be encoded in attribute (60xx,3000) Overlay Data, but masked in the “unused bits” of the pixel data (only for uncompressed transfer syntaxes). For backwards compatibility with legacy AE.
Select SC node	Select a previously configured node as target for Storage Commitment when sending DICOM objects to the configured AE. Default is the same node as to which the Objects are sent.
Select SC AET	Select AET that corresponds to the above selected node that receives the Storage Commitment request. Default is the above specified “AE Title”.
SC Result in same association	When checked the Artis zee/zeego DICOM application will await the Storage Commitment N-EVENT-REPORT on the same association. Default is “not checked” (= different association).
SC result timeout	Timeout in hours and minutes to wait at the open association. Default: 01**:**00 (hour**:**minutes).

Remote AE configuration item	Comment
If **Storage Commitment** Service support is checked	
n. a.	The related Storage Commitment configuration is either in the Storage section of the same AET or different AET (in case the current AET is only Storage Commitment Provider).
If **Query** Service support is checked	
provides DICOM Query model	The Query models supported by this AET can be selected. When possible, the STUDY ROOT model should preferably be configured
If **Retrieve** Service support is checked	
n. a.	Checking Retrieve support for an AET is the only needed configuration item. This will allow access to the "Import" feature in the Query result browser.
If **Modality Worklist** Service support is checked	
Query Waiting time	The time to wait for the C-FIND-RSP after sending the C-FIND-RQ (default 20 sec.)
Max Query Match Number	The maximum number of entries accepted in one worklist (default is 200)
Query Interval	The time between two C-FIND-RQ to the Hospital Information system (default is 60 min, minimum is 3 min, maximum is 1440 min i.e. 24 hours)
Automatic removal of canceled/rescheduled Requests	Checking this item will removed all unused entries from the scheduler list prior to inserting the worklist responses with each query.

4.4.2 Parameters

System parameters can be changed in the Service UI under "Configuration / DICOM / General" item - second page.

Table 52 - General parameter settings and timeouts

Time-out Values				
Parameter	**Default Value [sec]**	**Min [sec]**	**Max [sec]**	**Comment**
Accepting/Rejecting an Association Request	60	15	600	Wait for an Association Request or wait for a Peer to shut down the Association
Association Open Request	60	15	600	Wait for a reply to an Association Accept Request
Association Close Request	60	15	600	Wait for a reply to an Association Release Request
Accepting a Message over Network	300	15	600	Wait for a Network Write to be accepted

Time-out Values				
Parameter	**Default Value [sec]**	**Min [sec]**	**Max [sec]**	**Comment**
Waiting for Data between TCP/IP Packets	60	15	600	Wait for Data between TCP/IP packets
Response from Remote Node for Storage/Query/Retrieve	600	15	600	Time between Service Request and Service Response
Accept network connect	60	15	600	
General Transfer Setting				
Simultaneous DICOM associations	10	1	10	Number of simultaneous associations running.
Maximum PDU Size	32kByte	4kByte	1MByte	Proposed PDU size, each selectable value is doubled from previous, starting with 4kB. Additionally for optimization for some networks 28kByte are provided.

5 Application Profile Conformance Statement

The following "Offline Media Application Profiles (incl. private extensions)" are supported by Artis zee/zeego archive options.

Table 53 - Supported Application Profiles

Application Profile
Basic Cardiac
1024 Extended Cardiac
General Purpose CDR

5.1 Implementation Model

5.1.1 Application Data Flow Diagram

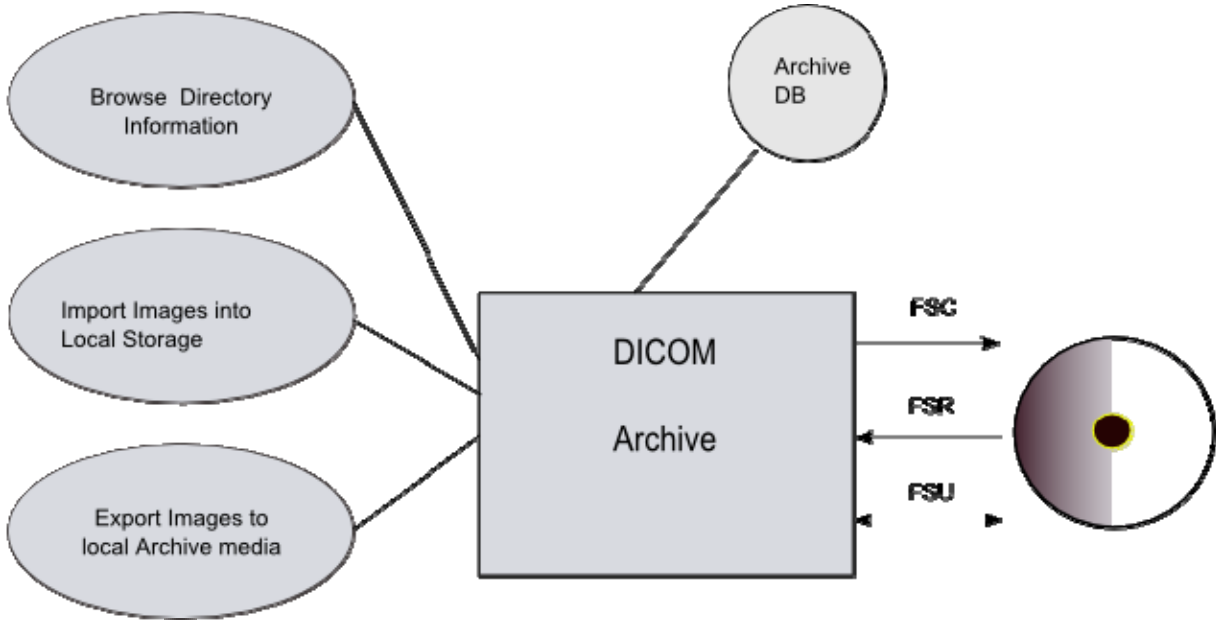

Table 54 - Application Data Flow DICOM Archive

The DICOM archive application will serve as an interface to the CD-R/DVD offline medium device.

The DICOM Archive application will support the 120mm CD-R and DVD medium.

The FSU role will update new SOP Instances only to media with pre-existing File-sets conforming to the Application Profiles supported.

The contents of the DICOMDIR will temporarily be stored in Archive-Database.

5.1.2 Functional Definitions of AEs

The Artis zee/zeego DICOM offline media storage application consists of the DICOM Archive application entity serving all interfaces to access offline media. The DICOM Archive application is capable of

- creating a new File-set onto an unwritten medium (Export to…).
- updating an existing File-set by writing new SOP Instances onto the medium (Export to...).
- importing SOP Instances from the medium onto local storage
- reading the File-sets DICOMDIR information into temporary database and pass it to display applications.

5.1.3 Activities

5.1.3.1 Description and Sequencing of Activity FSR

The DICOM Archive application will not perform transfers until the Directory information of the DICOMDIR is completely read in and displayed in the Browser.

5.1.4 Implementation Identifying Information

For Implementation Identifying Information please refer to “Table 3 - Implementation Identifying Information” in the “Conformance Statement Overview”.

5.2 AE Specifications

5.2.1 DICOM Archive Specification

The DICOM Archive provides Standard conformance to Media Storage Service Class (Interchange Option). Details are listed in following Table:

Table 55 - Mapping of Application Profiles Supported

Application Profiles Supported	Activity	Role	SC Option
STD-GEN-CD STD-XABC-CD STD-XA1K-CD STD-GEN-DVD STD-GEN-DVD-JPEG	Browse Directory Information	FSR	Interchange
	Import into local Storage	FSR	Interchange
	Export to local Archive Media	FSC, FSU	Interchange

5.2.1.1 File Meta Information for the Application Entity

The Source Application Entity Title is set by configuration and is same as used for Storage provider.

5.2.1.2 Activities of DICOM Archive

5.2.1.2.1 Activity "Browse Directory Information"

The DICOM Archive application acts as FSR using the interchange option when requested to read the media directory.

The DICOM archive application will read the DICOMDIR and insert those directory entries that are valid for the application profiles supported, into a local database. The database can then be used for browsing media contents.

Note: Icon Image Sequence is also supported in DICOMDIR. But only those Icon Images with Bits Allocated (0028,0100) equal to 8 and size of 64x64 or 128x128 pixels are imported into database and are visible in the Browser.

5.2.1.2.1.1 Media Storage Application Profile

See “Table 55 - Mapping of Application Profiles Supported” in section 5.2.1 for the Application Profiles listed that invoke this Application Entity for the Browse Directory Information activity.

5.2.1.2.2 Activity "Import into Local Storage"

The DICOM Archive application acts as FSR using the interchange option when being requested to read SOP Instances from the medium into the local storage.

The SOP Instance(s) selected from the media directory will be copied into the local storage. Only SOP Instances, that are valid for the application profile supported and are listed as supported by the Storage SCP Conformance section (Network DCS, 5.1.3), can be retrieved from media storage.

For media conforming to the STD-GEN-xxx Profile the following SOP Classes will be supported as FSR:

Table 56 - STD-GEN-xxx profile supported SOP Classes

Information Object Definition	SOP Class UID	Transfer Syntax UID
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Explicit VR Little Endian 1.2.840.10008.1.2.1 JPEG Lossless Process 14 (selection value 1) 1.2.840.10008.1.2.4.70
Comprehensive SR	1.2.840.10008.5.1.4.1.1.88.33	Explicit VR Little Endian 1.2.840.10008.1.2.1
X-Ray Radiation Dose SR	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian 1.2.840.10008.1.2.1
CSA Non-Image	1.3.12.2.1107.5.9.1	Explicit VR Little Endian 1.2.840.10008.1.2.1

5.2.1.2.2.1 Media Storage Application Profile

See “Table 55 - Mapping of Application Profiles Supported” in section 5.2.1 for the Application Profiles listed that invoke this Application Entity for the Import into Local Storage activity.

5.2.1.3 Activity “Export to Local Archive Media”

The DICOM Archive application acts as FSU (for media with existing DICOM file-set) or FSC (media not initialized) using the interchange option when requested to copy SOP Instances from the local storage to local Archive Medium.

The DICOM Archive application will receive a list of SOP Instances to be copied to the local archive medium. According to the state of the medium inserted (new medium, Medium with DICOM file-set) the validity of the SOP Instances according to the applicable profile is checked. Only valid SOP Instances are accepted.

The DICOM Archive application will not finalize the medium.

With the resizing feature of the Artis zee/zeego DICOM application, a copy of images in Cardiac Format (512x512, 8Bit) can be written onto medium.

5.2.1.3.1.1 Media Storage Application Profile

See “Table 55 - Mapping of Application Profiles Supported” in section 5.2.1 for the Application Profiles listed that invoke this Application Entity for the Export to Local Archive Media activity.

5.3 Augmented and Private Application Profiles

not applicable

5.4 Media Configuration

5.4.1 Single- / Multi-Session CD burning

Please refer to most recent Service / Configuration documentation of Artis zee/zeego for changing between the single-session and multi-session recording modes.

5.4.2 “Viewer on CD”

Please refer to most recent Service / Configuration documentation of Artis zee/zeego for changing between the

ACOM.PC Lite 2.0 or ***syngo* FastView**

as application that is included onto the medium as part of the “Viewer on CD” feature, if the feature is checked in the Media Creation user interface (see also next configuration item).

5.4.3 Auto-Labeling

Please refer to most recent Service / Configuration documentation of Artis zee/zeego for activating the auto-labeling of CD media to avoid the label inquiry dialog when using automatic media export. The auto-labeling can be activated with the “Viewer on CD” feature being implicitly checked or not.

6 Support of Extended Character Sets

The Artis zee/zeego DICOM application supports the following character sets as defined in the four tables below:

Table 57 - Supported Single-Byte Character Sets (w/o Code Ext.)

Character Set Description	Defined Term	ISO registration number	Character Set
Default repertoire	none	ISO_IR 6	ISO 646:
Latin alphabet No. 1	ISO_IR 100	ISO_IR 100	Supplementary set
		ISO_IR 6	ISO 646:
Latin alphabet No. 2	ISO_IR 101	ISO_IR 101	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 3	ISO_IR 109	ISO_IR 109	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 4	ISO_IR 110	ISO_IR 110	Supplementary set
		ISO_IR 6	ISO 646
Cyrillic	ISO_IR 144	ISO_IR 144	Supplementary set
		ISO_IR 6	ISO 646
Arabic	ISO_IR 127	ISO_IR 127	Supplementary set
		ISO_IR 6	ISO 646
Greek	ISO_IR 126	ISO_IR 126	Supplementary set
		ISO_IR 6	ISO 646
Hebrew	ISO_IR 138	ISO_IR 138	Supplementary set
		ISO_IR 6	ISO 646
Latin alphabet No. 5	ISO_IR 148	ISO_IR 148	Supplementary set
		ISO_IR 6	ISO 646
Japanese	ISO_IR 13	ISO_IR 13	JIS X 0201: Katakana
		ISO_IR 14	JIS X 0201: Romaji

Table 58 - Supported Single-Byte Character Sets (with Code Ext.)

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Default repertoire	ISO 2022 IR 6	ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.1	ISO 2022 IR 100	ISO 2022	ESC 02/13 04/01	ISO-IR 100	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.2	ISO 2022 IR 101	ISO 2022	ESC 02/13 04/02	ISO-IR 101	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.3	ISO 2022 IR 109	ISO 2022	ESC 02/13 04/03	ISO-IR 109	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.4	ISO 2022 IR 110	ISO 2022	ESC 02/13 04/04	ISO-IR 110	Supplementary set

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Cyrillic	ISO 2022 IR 144	ISO 2022	ESC 02/13 04/12	ISO-IR 144	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Arabic	ISO 2022 IR 127	ISO 2022	ESC 02/13 04/07	ISO-IR 127	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Greek	ISO 2022 IR 126	ISO 2022	ESC 02/13 04/06	ISO-IR 126	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Hebrew	ISO 2022 IR 138	ISO 2022	ESC 02/13 04/08	ISO-IR 138	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Latin alphabet No.5	ISO 2022 IR 148	ISO 2022	ESC 02/13 04/13	ISO-IR 148	Supplementary set
		ISO 2022	ESC 02/08 04/02	ISO-IR 6	ISO 646
Japanese	ISO 2022 IR 13	ISO 2022	ESC 02/09 04/09	ISO-IR 13	JIS X 0201: Katakana
		ISO 2022	ESC 02/08 04/10	ISO-IR 14	JIS X 0201-1976: Romaji

Table 59 - Supported Multi-Byte Character Sets (w/o Code Ext.)

Character Set Description	Defined Term	ISO registration number	Character Set
Unicode	ISO_IR 192	ISO 10646	Unicode in UTF-8
Chinese	GB18030	GB18030	GB 18030-2000 (China Association for Standardization)

Table 60 - Supported Multi-Byte Character Sets (with Code Ext.)

Character Set Description	Defined Term	Standard for Code Extension	ESC sequence	ISO registration number	Character Set
Japanese	ISO 2022 IR 87	ISO 2022	ESC 02/04 04/02	ISO-IR 87	JIS X 0208: Kanji
	ISO 2022 IR 159	ISO 2022	ESC 02/04 02/08 04/04	ISO-IR 159	JIS X 0212: Supplementary Kanji set
Chinese[i]	ISO 2022 IR 58	ISO 2022	ESC 02/04 04/01	ISO-IR 58	GB2312-80 (China Association for Standardization)

[i] Note: This Character Set is an extension of DICOM for the Chinese language.

When there is a mismatch between the Specific Character Set tag (0008,0005) and the characters in an IOD received by the system, then the following measures are taken to make the characters DICOM conform:

- Try to import with ISO_IR 100. If ISO_IR 100 fails, convert each illegal character to a '?'.

  There are now three categories of character sets which have to be differentiated because of their different encoding formats:
  - Conventional ISO character sets: ISO_IR 6, ISO 2022 IR 6, ISO_IR 100, etc. → encoded in ISO 2022
  - ISO IR_192 → encoded in UTF-8
  - GB18030 → encoded in GB18030

It is not possible to recognize the following mismatches automatically on receiving or importing:

- An attribute value is encoded in ISO_IR 192 ← → (0008,0005) contains a conventional ISO character set as primary character set.
- An attribute value is encoded in GB18030 ← → (0008,0005) contains a conventional ISO character set as primary character set.
- An attribute value is encoded in ISO 2022 ← → (0008,0005) contains ISO_IR 192.
- An attribute value is encoded in ISO 2022 ← → (0008,0005) contains GB18030

An IOD that contains one of the above mentioned inconsistencies is not DICOM conform. As these kinds of inconsistencies cannot be recognized by the system, the IOD will not be rejected but the character data might not be displayed as intended.

Older versions of Artis zee/zeego do not support the newly introduced character sets ISO_IR 192 and GB18030 and their special encodings. That means, an IOD which contains one of these new character sets in (0008,0005) will be rejected by an older Artis zee/zeego.

7 Security

The Artis zee/zeego is supporting security by having the firewall of the underlying operating system active. Besides the standard ports of the operating system, only the DICOM Port (104) is opened.

When "trusted host functionality" is enabled, the Artis zee/zeego only accepts DICOM communication from other AE if the related System is configured with its hostname, port and AET.

8 Annexes

8.1 IOD Contents

8.1.1 Created SOP Instances

8.1.1.1 XA Standard Extended SOP Class

The Artis zee/zeego system will create images during acquisition and with post processing applications. Those will be encoded as XA Standard Extended SOP Class. Images created during post processing will be marked as derived. Please see the following table for a complete overview of supplied Type 1/2/3 Standard and additional Private Attributes:

The Standard DICOM Modules will be used to encode ECG data.

8.1.1.1.1 "Acquired Image" or derived XA image

Table 61 - XA acquired or derived image

Attribute Name	Tag	Value
Specific Character Set	(0008,0005)	From Configuration / RIS
Image Type	(0008,0008)	See "8.5.1.6 SOP Common Module - Image Type Extensions"
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.12.1
SOP Instance UID	(0008,0018)	
Study Date	(0008,0020)	<yyyymmdd>
Series Date	(0008,0021)	<yyyymmdd>
Acquisition Date	(0008,0022)	Date of Original Acquisition (X-Ray event)
Content Date	(0008,0023)	<yyyymmdd> (Date of pixel data creation) Note: in Resize or Ready Process mode pixel data is created at date of transfer
Study Time	(0008,0030)	<hhmmss>
Series Time	(0008,0031)	<hhmmss>
Acquisition Time	(0008,0032)	Time of Original Acquisition (X-Ray event)
Content Time	(0008,0033)	<hhmmss> (Time of pixel data creation) Note: in Resize or Ready Process mode pixel data is created at date of transfer
Accession Number	(0008,0050)	RIS or "Accession No." input
Modality	(0008,0060)	XA
Manufacturer	(0008,0070)	Siemens
Institution Name	(0008,0080)	RIS or "Institution Name" input
Institution Address	(0008,0081)	RIS
Referring Physician's Name	(0008,0090)	RIS or input
Station Name	(0008,1010)	from Configuration
Study Description	(0008,1030)	"Study" input
Series Description	(0008,103E)	"Organ Program" name or one of : EXAM PROTOCOL, , QCA REPORT, LVA REPORT
Physicians of Record	(0008,1048)	From RIS (0040,1010) Names of Intended Recipients of Results
Performing Physician's Name	(0008,1050)	"Performing Physician 1"\"Performing Physician 2" input
Operator's Name	(0008,1070)	"Operator 1"\"Operator 2" input
Admitting Diagnosis Description	(0008,1080)	"Admitting Diagnosis" input
Manufacturer's Model Name	(0008,1090)	AXIOM-Artis
Referenced Study Sequence	(0008,1110)	From RIS

Attribute Name	Tag	Value
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Performed Procedure Step Sequence	(0008,1111)	Set when MPPS is configured
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Patient Sequence	(0008,1120)	From RIS
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Image Sequence	(0008,1140)	Reference to related Plane with BIPLANE A/B Instances
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Derivation Description	(0008,2111)	Notes about transformation steps
Start Trim	(0008,2142)	<1 st frame to display>
Stop Trim	(0008,2143)	<last frame to display>
Recomm. Display Frame Rate	(0008,2144)	(in f/s)
Patient's Name	(0010,0010)	RIS or "Patient Name" input
Patient ID	(0010,0020)	RIS or "Patient ID" input
Patient's Birth Date	(0010,0030)	RIS or checked "Date of Birth" input
Patient's Sex	(0010,0040)	RIS or input (M or F or O/unknown)
Other Patient IDs	(0010,1000)	From RIS
Other Patient Names	(0010,1001)	From RIS
Patient's Age	(0010,1010)	Calculated from “Date of Birth” input
Patient's Size	(0010,1020)	(in meters)
Patient‘s Weight	(0010,1030)	(in kilograms)
Patient’s Address	(0010,1040)	“Address” input
Military Rank	(0010,1080)	From RIS
Medical Alerts	(0010,2000)	From RIS
Contrast Allergies	(0010,2110)	From RIS
Ethnic Group	(0010,2160)	From RIS
Smoking Status	(0010,21A0)	From RIS
Additional Patient History	(0010,21B0)	From RIS
Pregnancy Status	(0010,21C0)	From RIS
Last Menstrual Date	(0010,21D0)	From RIS
Patient Comment	(0010,4000)	“Additional Info” input
Contrast/Bolus Agent	(0018,0010)	
Cine Rate	(0018,0040)	<acquired frame rate>
KVP	(0018,0060)	<peak KV used> (KV)
Device Serial Number	(0018,1000)	<modality serial number>
Software Version	(0018,1020)	
Protocol Name	(0018,1030)	“Organ Program” input
Contrast Bolus Ingredient	(0018,1048)	
Frame Time	(0018,1063)	(msec/frame) for fixed frame rates
Frame Time Vector	(0018,1065)	<number of Frame values>(msec) for variable frame rates
Distance Source to Detector	(0018,1110)	(mm)
Distance Source to Patient	(0018,1111)	(mm)
Estimated Radiographic Magnification Factor	(0018,1114)	<Ratio of SID/SOD>
Exposure Time	(0018,1150)	<duration of x-Ray exposure>(msec)
X-Ray Tube Current	(0018,1151)	(mA)
Average Pulse Width	(0018,1154)	(msec)
Radiation Setting	(0018,1155)	SC | GR

Attribute Name	Tag	Value
Radiation Mode	(0018,115A)	CONTINUOUS | PULSED
Image and Fluoroscopy Area Dose Product	(0018,115E)	(dGy*cm*cm)
Intensifier Size	(0018,1162)	<(zoomed) diameter> (mm)
Imager Pixel Spacing	(0018,1164)	<row space, col space>(mm)
Focal Spot	(0018,1190)	(mm)
Positioner Motion	(0018,1500)	STATIC | DYNAMIC
Positioner Primary Angle	(0018,1510)	(degrees); 0 with DYNAMIC
Positioner Secondary Angle	(0018,1511)	(degrees); 0 with DYNAMIC
Positioner Primary Angle Increment	(0018,1520)	Only with DYNAMIC (absolute values)
Positioner Secondary Angle Increment	(0018,1521)	Only with DYNAMIC (absolute values)
Shutter Shape	(0018,1600)	RECTANGULAR
Shutter Left Vertical Edge	(0018,1602)	<column number left edge>
Shutter Right Vertical Edge	(0018,1604)	<column number right edge>
Shutter Upper Horizontal Edge	(0018,1606)	<row number upper edge>
Shutter Lower Horizontal Edge	(0018,1608)	<row number lower edge>
Collimator Shape	(0018,1700)	RECTANGULAR
Collimator Left Vertical Edge	(0018,1702)	<column number left edge>
Collimator Right Vertical Edge	(0018,1704)	<column number right edge>
Collimator Upper Horizontal Edge	(0018,1706)	<row number upper edge>
Collimator Lower Horizontal Edge	(0018,1708)	<row number lower edge>
Patient Position	(0018,5100)	Mandatory “Patient Position” input
Detector Description	(0018,7006)	
Detector ID	(0018,700A)	
Private Creator	(0019,00xx)	SIEMENS SMS-AX VIEW 1.0
Attributes according to "8.5.1.2 Angio Viewing Module"		
Study Instance UID	(0020,000D)	From RIS or system generated
Series Instance UID	(0020,000E)	
Study ID	(0020,0010)	From RIS Requested Procedure ID or system created
Series Number	(0020,0011)	
Instance Number	(0020,0013)	
Patient Orientation	(0020,0020)	calculated from "Patient Position" input and from Gantry coordinate data.
Laterality	(0020,0060)	input via L or R marker annotation, else absent
Images in Acquisition	(0020,1002)	
Image Comments	(0020,4000)	Not encoded or "SM" or "REF"
Private Creator	(0021,00xx)	SIEMENS SMS-AX ACQ 1.0
Attributes according to "8.5.1.3 Angio Acquisition Data Module"		
Private Creator	(0023,00xx)	SIEMENS SMS-AX QUANT 1.0
Attributes according to "8.5.1.4 Angio Quantification Module" if image was calibrated		
Private Creator	(0025,00xx)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0
Attributes according to "8.5.1.5 Original Image Info Module"		
Samples per Pixel	(0028,0002)	1
Photometric Interpretation	(0028,0004)	MONOCHROME2
Number of Frames	(0028,0008)	
Frame Increment Pointer	(0028,0009)	(0018,1063) or (0018,1065) for variable frame rate
Rows	(0028,0010)	Up to 2480
Columns	(0028,0011)	Up to 2480
Bits Allocated	(0028,0100)	8 | 16
Bits Stored	(0028,0101)	8 | 12 | 16
High Bit	(0028,0102)	7 | 11 | 15
Pixel Representation	(0028,0103)	0
Pixel Intensity Relationship	(0028,1040)	LIN | LOG | DISP

Attribute Name	Tag	Value
Window Center	(0028,1050)	<NAT value>
Window Width	(0028,1051)	<NAT value>
VOI LUT Function	(0028,1056)	LINEAR | SIGMOID not set means linear windowing
Recommended Viewing Mode	(0028,1090)	SUB | NAT
Lossy Image Compression	(0028,2110)	
Modality LUT Sequence	(0028,3000)	(if [0028,1040] = LOG)
>LUT Descriptor	(0028,3002)	<num of LUT entries>, <first pixel val mapped>, <Entry bits alloc>
>Modality LUT Type	(0028,3004)	US
>LUT data	(0028,3006)	<array of data, accord. descriptor>
Representative Frame Number	(0028,6010)	<e.g. frame number of Icon Image>
Mask Subtraction Sequence	(0028,6100)	
>Mask Operation	(0028,6101)	AVG_SUB
>Mask Frame Numbers	(0028,6110)	(only for AVG_SUB)
Private Creator	(0029,00xx)	CARDIO-D.R. 1.0
Attributes according to "8.5.1.1 Edge Enhancement Module"		
Private Creator	(0029,00xx)	CARDIO-D.R. 1.0
Attributes according to "8.5.2.1 MEDCOM Header"		
Study ID Issuer	(0032,0012)	internal study identifier
Requesting Physician	(0032,1032)	From RIS
Requesting Service	(0032,1033)	From RIS
Requested Procedure Description	(0032,1060)	From RIS
Requested Procedure Code Sequence	(0032,1064)	From RIS
>Code Value	(0008,0100)	From RIS
>Coding Scheme Designator	(0008,0102)	From RIS
>Coding Scheme Version	(0008,0103)	From RIS
>Code Meaning	(0008,0104)	From RIS
Study Comments	(0032,4000)	Patient Registration input
Special Needs	(0038,0050)	From RIS
Patient State	(0038,0500)	From RIS
Performed Procedure Step Start Date	(0040,0244)	supplied, even if MPPS SOP Class is not supported
Performed Procedure Step Start Time	(0040,0245)	supplied, even if MPPS SOP Class is not supported
Performed Procedure Step ID	(0040,0253)	supplied, even if MPPS SOP Class is not supported, "XAyyyymmddhhmmss" is set with 1st Image acquired
Request Attributes Sequence	(0040,0275)	
>Scheduled Procedure Step Description	(0040,0007)	From RIS
>Scheduled Procedure Step ID	(0040,0009)	From RIS
>Requested Procedure ID	(0040,1001)	From RIS or “Request ID” input
Confidentiality Constraint on Patient Data Description	(0040,3001)	From RIS
Private Creator	(0019,00xx)	PMI Private Calibration Module Version 2.0
Attributes according to "8.5.1.4 Angio Quantification Module"		
Curve Dimensions	(5000,0005)	2
Number of Points	(5000,0010)	<number of data points>
Type of Data	(5000,0020)	ECG
Axis Units	(5000,0030)	DPPS\NONE (DPPS = data points per second)
Data Value Presentation	(5000,0103)	0000h
Curve Data Descriptor	(5000,0110)	0\1
Coordinate Start Value	(5000,0112)	0
Coordinate Step Value	(5000,0114)	<sampling rate>
Curve Data	(5000,3000)	

Attribute Name	Tag	Value
Overlay Rows	(60xx,0010)	
Overlay Columns	(60xx,0011)	
Number of Frames in Overlay	(60xx,0015)	<number>
Overlay Description	(60xx,0022)	
Overlay Type	(60xx,0040)	G
Overlay Origin	(60xx,0050)	1\1
Image Frame Origin	(60xx,0051)	1
Overlay Bits Allocated	(60xx,0100)	1 or 16
Overlay Bit Position	(60xx,0102)	12 or 0 (if Overlay encoded in [60xx,3000])
Overlay Data	(60xx,3000)	<contains Overlay>
Pixel Data	(7FE0,0010)	

8.1.1.1.2 Quant Report Images - derived XA

The Artis zee/zeego will create result images from performing Quantitative Analysis Functions. To ensure image interchange, the resulting reports can be converted to standard XA multi-frame images. The pixel data contain the result information as an image.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Acquisition specific information (e.g. KVP, mA) is taken from the original image that was subject to the analysis. Not applicable information is set either to default values or not set at all.

The overlay graphic and curve module are not used with Quant images.

Quant images are always sent as 1024x1024 12 bit. Multi-frames are used to support reports with multiple pages.

8.1.1.1.3 Exam Protocol as XA Image

The Artis zee/zeego will generate an X-Ray Radiation Dose SR object to store all dose and acquisition relevant information for all irradiation events. An excerpt of this information is displayed to the user as "Exam Protocol". This displayed Exam Protocol can be converted to an XA multi-frame image. The pixel data contain the protocol data as an image.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Acquisition specific information (e.g. KVP, mA) and further information is set either to default values (type 1), set to zero length (type 2) or not set at all.

The overlay graphic and curve module are not used with Exam Protocol as XA image.

8.1.1.1.4 CT/MR Image converted to XA Image

The Artis zee/zeego system will create reference images from CT or MR images. Those will be encoded as derived XA Standard Extended SOP Class to support display at the XA image viewing application.

All patient and study level information is taken from the original CT/MR image.

Image Pixel data is converted and set to a format that it is supported by the viewing application.

The overlay graphic is taken from the original image.

Note: The Artis zee/zeego supports only conversion of CT/MR images with matrix size 512x512 and 1024x1024 and bit depth 8, 10 or 12 bit. For other formats an additional converter functionality has to be installed.

8.1.1.2 SR Document SOP Class

The Artis zee/zeego will create Reports on demand for long-term archival of Quantitative Analysis results. Furthermore an X-Ray Radiation Dose SR is created for each Study performed on the system. Please refer to next sections to learn about the SR implementation and the definition of the underlying SR template.

8.1.1.2.1 X-Ray Radiation Dose SR SOP Class

The Artis zee/zeego will create X-Ray Radiation Dose SRs implementing TID 10001 *Projection X-Ray Radiation Dose*

For every single irradiation event an entry is made into the SR.
The scope of accumulation is "Study". The report is kept open (Completion Flag (0040,A491) = "PARTIAL") to support continuation of the study. Updating of a SR will not change the SOP Instance UID.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Attribute mapping from Modality Worklist to X-Ray Radiation Dose SR is equal to the mapping into acquired images. Please refer to Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes for mapping of worklist information.

For details on the contents of the Accumulated X-Ray Dose Container (TID 10002), please see table below (one container per plane).

Table 62 - Details on Accumulated X-Ray Dose Data

Concept Name	Comments on Concept Value
Dose Area Product Total	The accumulated dose area product (measured with dose chamber near collimator) applied during fluoro and acquisition performed in this plane [Gym^2].
Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro and acquisition performed in this plane [Gy]. (Not corrected for backscatter)
Fluoro Dose Area Product Total	The accumulated dose area product applied during fluoro performed in this plane [Gym^2].
Fluoro Dose (RP) Total	Calculated accumulated dose at the RP applied during fluoro performed in this plane [Gy].
Total Fluoro Time	Total time of fluoro performed in this plane [s]. (pedal time)
Acquisition Dose Area Product Total	The accumulated dose area product applied during acquisition performed in this plane [Gym^2].
Acquisition Dose (RP) Total	Calculated accumulated dose at the RP applied during acquisition performed in this plane [Gy].
Total Acquisition Time	Total time of acquisition performed in this plane [s]. (pedal time)

For details on the contents of the Irradiation Event Container (TID 10003), please see table below (one container per irradiation event).

Table 63 - Details on Dose SR Irradiation Event Data

Concept Name	Comments on Concept Value
Acquisition Plane	“Plane A” - taken by primary plane of biplane system “Plane B” - taken by secondary plane of biplane system

Concept Name	Comments on Concept Value
	"Single Plane" - taken by a single-plane system
DateTime Started	Start of X-Ray
Irradiation Event Type	"Fluoroscopy" - irradiation applied by Fluoro pedal "Stationary Acquisition" - irradiation applied by Acquisition pedal, no system-controlled movement "Rotational Acquisition" - irradiation applied by Acquisition pedal, system-controlled rotational movement
Acquisition Protocol	Name of the organ program used to parameterize this irradiation event
Reference Point Definition	The Interventional Reference Point (IRP) for the system is always "15cm from Isocenter toward Source"
Acquired Image	SOP Instance UID of the acquired image as link to that image. Always present for "Stationary Acquisition" and "Rotational Acquisition". Only present for "Fluoroscopy" if the 'Store Fluoro Scene' feature was used to permanently store the Fluoro result (max. 300 Frames in ring buffer).
Irradiation Event UID	UID identifying this event.
Dose Area Product	The dose area product (measured with dose chamber near collimator) applied by this irradiation event in [Gym^2].
Dose (RP)	Calculated dose at the RP in [Gy]. (Not corrected for backscatter)
Positioner Primary Angle	Patient-based angle of the primary plane in [°]. For "Rotational Acquisition" this is the start position of the movement.
Positioner Secondary Angle	Patient-based angle of the secondary plane in [°]. For "Rotational Acquisition" this is the start position of the movement.
Positioner Primary End Angle	Only with "Rotational Acquisition" - this is the primary plane end position of the movement.
Positioner Secondary End Angle	Only with "Rotational Acquisition" - this is the secondary plane end position of the movement.
X-Ray Filters	A CONTAINER with the subsequent items marked with a ">"
>X-Ray Filter Type	Either "No Filter" or "Strip Filter" is set.
>X-Ray Filter Material	If filter is used, a value of "Copper or Copper Compound" is set.
>X-Ray Filter Thickness Minimum	Minimal thickness of the applied filter in [mm].
>X-Ray Filter Thickness Maximum	Maximal thickness of the applied filter in [mm]. Artis uses uniform filter thickness, so this value always matches the minimal thickness value.
Fluoro Mode	Only with "Fluoroscopy" - Artis uses "Pulsed" Fluoroscopy only
Pulse Rate	The used pulse rate for this irradiation event in [pulse/s].
Number of Pulses	The number of X-Ray pulses generated during performance of this irradiation event.
KVP	The mean-value for the voltage applied by this irradiation event in [kV].
X-Ray Tube Current	The mean-value for the tube current applied by this irradiation event in [mA].
Exposure Time	Time calculated according to the term "Number of Pulses" x "Pulse Width". Is the "X-Ray on" time for this irradiation even in [ms]. This is not the "pedal time" (esp. the time the pedal was activated).
Pulse Width	The mean-value for the pulse width for each X-Ray pulse applied by this irradiation event in [ms].
Exposure	Exposure value calculated according to the term "X-Ray Tube Current" x "Exposure Time" in [uAs]
Focal Spot Size	Size of the focal spot in [mm] that was used during the performance of this irradiation event.
Distance Source to Detector	The Source Image Distance (SID) as it is valid at the end of the irradiation event in [mm].
Distance Source to Isocenter	The fixed value of the Source to Isocenter distance in [mm]. Value depends on the c-arm model.
Table Longitudinal Position	The offset (in [mm]) of the table origin (at the table head end) to the Isocenter in table lateral direction (with the patient lying in head-first supine position, the value is incrementing in the left lateral direction of the patient. The zero coordinate is in the centerline of the table).
Table Lateral Position	The offset (in [mm]) of the table origin (at the table head end) to the Isocenter in table longitudinal direction (with the patient lying in head-first supine position, the value is incrementing in cranial direction of the patient. The zero coordinate is at the table head side end).
Table Height Position	The offset of the table origin (at the table head end) to the Isocenter in table lift direction (with the patient lying in head-first supine position, the value is incrementing in anterior direction of the patient. Positive values indicate the Isocenter is ABOVE the table plane. The zero coordinate is in the table plane).
Target Region	Fixed value of "Entire body" is used.

Concept Name	Comments on Concept Value
Comment	Contains additional information items from the Exam Report in XML like structure. There are separate contents for “Fluoroscopy” or “Acquisition”. For details see paragraph below this table.
Device Role in Procedure	The value of “Irradiating Device” is always set. The subsequent items marked with a “>” give additional details.
>Device Name	Logical name of the device taken from site configuration. Is also used as Station Name (0008,1010) in DICOM Image Header.
>Device Manufacturer	The value of “Siemens” is always set. Is also used as Manufacturer (0008,0070) in DICOM Image Header.
>Device Model Name	The value of “AXIOM-Artis” is always set. Is also used as Manufacturer’s Model Name (0008,1090) in DICOM Image Header.
>Device Serial Number	Serial number of the device taken from site configuration. Is also used as Device Serial Number (0018,1000) in DICOM Image Header.

In case of “Fluoroscopy” the following XML structure is provided in the “Comment” Concept Value (the values are sample values and will be individually set for each event):

```
<FluoroData>
<SceneCounter SRData="1"/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="FL xLow"/>
<AngulationStep SRData=" "/>
<Dose SRData="0.010000"/>
<CurrentTimeProduct SRData="36.720005"/>
<TubeFocalSpot SRData="small"/>
<iiDiameter SRData="220"/>
<Time SRData="20-Sep-10 17:31:57"/>
<IsPuck SRData="False"/>
<SceneTime SRData="4"/>
<FrameRate SRData="7.500000"/>
<NumOfFrames SRData="30"/>
</FluoroData>
```

In case of “Stationary Acquisition” or “Rotational Acquisition” the following XML structure is provided in the “Comment” Concept Value (the values are sample values and will be individually set for each event):

```
<AcquisitionData>
<SceneCounter SRData="1"/>
<AcqMode SRData="CARD"/>
<PeriDynaStepCount SRData=" "/>
<SceneName SRData="Coro RL"/>
<AcqType SRData="FIXED"/>
<AngulationStep SRData=" "/>
<Dose SRData="0.070000"/>
<CurrentTimeProduct SRData="561.586121"/>
<TubeFocalSpot SRData="large"/>
<iiDiameter SRData="220"/>
<Time SRData="20-Sep-10 17:32:02"/>
<IsPuck SRData="False"/>
<SceneTime SRData="9"/>
<FrameRate SRData="10.000000"/>
<NumOfFrames SRData="88"/>
</AcquisitionData>
```

8.1.1.2.2 Comprehensive SR SOP Class

The Artis zee/zeego will utilize the Comprehensive SR SOP Class to report measurements from the quantification application. It is implementing TID 3202 *Ventricular Analysis* to create the SR.

All patient level, study level and equipment information is taken from the acquired images of the related procedure.

Attribute mapping from Modality Worklist to X-Ray Radiation Dose SR is equal to the mapping into acquired images. Please refer to Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes for mapping of worklist information.

8.1.2 Usage of attributes from received IODs

Please refer to the “SOP-specific conformance…” sections in the DICOM networking part of this DCS for more details on attribute specific handling.

8.1.3 Attribute mapping

The Artis zee/zeego implements an actor Acquisition Modality according to the IHE Scheduled Workflow (SWF) profile.
The relationships between attributes received via Modality Worklist, stored in acquired images and communicated via MPPS are summarized in Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes

8.1.4 Coerced/Modified fields

The Artis zee/zeego DICOM Application is not performing data coercion.

8.2 Data Dictionary of private Attributes

Table 64 - Data Dictionary of Private Attributes

Tag	Private Owner Code	Name	VR	VM
(0019,xx00)	SIEMENS SMS-AX VIEW 1.0	Review Mode	US	1
(0019,xx01)	SIEMENS SMS-AX VIEW 1.0	Anatomical Background Percent	US	1
(0019,xx02)	SIEMENS SMS-AX VIEW 1.0	Number of Phases	US	1
(0019,xx03)	SIEMENS SMS-AX VIEW 1.0	Apply Anatomical Background	US	1
(0019,xx04)	SIEMENS SMS-AX VIEW 1.0	Pixel Shift Array	SS	4-4n
(0019,xx05)	SIEMENS SMS-AX VIEW 1.0	Brightness	US	1
(0019,xx06)	SIEMENS SMS-AX VIEW 1.0	Contrast	US	1
(0019,xx07)	SIEMENS SMS-AX VIEW 1.0	Enabled Shutters	US	1
(0019,xx08)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Percent Gain	US	1
(0019,xx09)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. LUT Index	SS	1
(0019,xx0A)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Kernel Size	SS	1
(0019,xx0B)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Percent Gain	US	1
(0019,xx0C)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. LUT Index	SS	1
(0019,xx0D)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Kernel Size	SS	1
(0019,xx0E)	SIEMENS SMS-AX VIEW 1.0	Fade Percent	US	1
(0019,xx0F)	SIEMENS SMS-AX VIEW 1.0	Flipped before Laterality Applied	US	1
(0019,xx10)	SIEMENS SMS-AX VIEW 1.0	Apply Fade	US	1
(0019,xx12)	SIEMENS SMS-AX VIEW 1.0	Zoom	US	1
(0019,xx13)	SIEMENS SMS-AX VIEW 1.0	Pan X	SS	1
(0019,xx14)	SIEMENS SMS-AX VIEW 1.0	Pan Y	SS	1
(0019,xx15)	SIEMENS SMS-AX VIEW 1.0	Native Edge Enh. Adv Percent Gain	SS	1
(0019,xx16)	SIEMENS SMS-AX VIEW 1.0	Subtr. Edge Enh. Adv Percent Gain	SS	1
(0019,xx17)	SIEMENS SMS-AX VIEW 1.0	Invert Flag	US	1
(0019,xx1A)	SIEMENS SMS-AX VIEW 1.0	Quant 1K Overlay	OB	1
(0019,xx1B)	SIEMENS SMS-AX VIEW 1.0	Original Resolution	US	1
(0019,xx1C)	SIEMENS SMS-AX VIEW 1.0	Auto Window Center	DS	1
(0019,xx1D)	SIEMENS SMS-AX VIEW 1.0	Auto Window Width	DS	1
(0019,xx1E)	SIEMENS SMS-AX VIEW 1.0	Auto Window Correct Value	IS	2
(0019,xx1F)	SIEMENS SMS-AX VIEW 1.0	Sigmoid Window Parameter	DS	1
(0021,xx00)	SIEMENS SMS-AX ACQ 1.0	Acquisition Type	US	1
(0021,xx01)	SIEMENS SMS-AX ACQ 1.0	Acquisition Mode	US	1
(0021,xx02)	SIEMENS SMS-AX ACQ 1.0	Footswitch Index	US	1
(0021,xx03)	SIEMENS SMS-AX ACQ 1.0	Acquisition Room	US	1
(0021,xx04)	SIEMENS SMS-AX ACQ 1.0	Current Time Product	SL	1
(0021,xx05)	SIEMENS SMS-AX ACQ 1.0	Dose	SL	1
(0021,xx06)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Percent	SL	1
(0021,xx07)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Accumulation	SL	1
(0021,xx08)	SIEMENS SMS-AX ACQ 1.0	Skin Dose Rate	SL	1
(0021,xx0A)	SIEMENS SMS-AX ACQ 1.0	Copper Filter	UL	1
(0021,xx0B)	SIEMENS SMS-AX ACQ 1.0	Measuring Field	US	1
(0021,xx0E)	SIEMENS SMS-AX ACQ 1.0	Total Steps	SS	1
(0021,xx0F)	SIEMENS SMS-AX ACQ 1.0	Dyna X-Ray Info	SL	4-4n
(0021,xx10)	SIEMENS SMS-AX ACQ 1.0	Modality LUT Input Gamma	ÚS	1
(0021,xx11)	SIEMENS SMS-AX ACQ 1.0	Modality LUT Output Gamma	US	1
(0021,xx12)	SIEMENS SMS-AX ACQ 1.0	SH_STPAR	OB	1
(0021,xx13)	SIEMENS SMS-AX ACQ 1.0	Acquisition Zoom	US	1
(0021,xx14)	SIEMENS SMS-AX ACQ 1.0	Dyna Angulation Step	SS	1
(0021,xx15)	SIEMENS SMS-AX ACQ 1.0	DDO Value	US	1

Tag	Private Owner Code	Name	VR	VM
(0021,xx16)	SIEMENS SMS-AX ACQ 1.0	DR Single Flag	US	1
(0021,xx17)	SIEMENS SMS-AX ACQ 1.0	Source to Isocenter	SL	1
(0021,xx19)	SIEMENS SMS-AX ACQ 1.0	ECG Index Array	SL	1
(0021,xx1A)	SIEMENS SMS-AX ACQ 1.0	FD Flag	US	1
(0021,xx1B)	SIEMENS SMS-AX ACQ 1.0	SH_ZOOM	OB	1
(0021,xx1C)	SIEMENS SMS-AX ACQ 1.0	SH_COLPAR	OB	1
(0021,xx1D)	SIEMENS SMS-AX ACQ 1.0	K-Factor	US	1
(0021,xx1E)	SIEMENS SMS-AX ACQ 1.0	EVE	US	8
(0021,xx1F)	SIEMENS SMS-AX ACQ 1.0	Total Scene Time	SL	1
(0021,xx20)	SIEMENS SMS-AX ACQ 1.0	Restore Flag	US	1
(0021,xx21)	SIEMENS SMS-AX ACQ 1.0	Stand Movement Flag	US	1
(0021,xx22)	SIEMENS SMS-AX ACQ 1.0	FD Rows	US	1
(0021,xx23)	SIEMENS SMS-AX ACQ 1.0	FD Columns	US	1
(0021,xx24)	SIEMENS SMS-AX ACQ 1.0	Table Movement Flag	US	1
(0021,xx27)	SIEMENS SMS-AX ACQ 1.0	IC Stent Flag	US	1
(0021,xx28)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Sequence	SQ	1
(0021,xx2A)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Phase Center	IS	1
(0021,xx2B)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Phase Width	IS	1
(0021,xx30)	SIEMENS SMS-AX ACQ 1.0	Organ Program Info	OB	1
(0021,xx3B)	SIEMENS SMS-AX ACQ 1.0	mAs Modulation	IS	1
(0021,xx3C)	SIEMENS SMS-AX ACQ 1.0	3D R-Peak Reference Time	DT	1-n
(0021,xx3D)	SIEMENS SMS-AX ACQ 1.0	ECG Frame Time Vector	SL	1-n
(0021,xx3E)	SIEMENS SMS-AX ACQ 1.0	ECG Start Time of Run	SL	1
(0021,xx40)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Descriptor	US	3
(0021,xx41)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Type	LO	1
(0021,xx42)	SIEMENS SMS-AX ACQ 1.0	Gamma LUT Data	US	1-n
(0021,xx51)	SIEMENS SMS-AX ACQ 1.0	3D Positioner Primary Start Angle	DS	1
(0021,xx52)	SIEMENS SMS-AX ACQ 1.0	3D Positioner Secondary Start Angle	DS	1
(0021,xx53)	SIEMENS SMS-AX ACQ 1.0	Stand Position	SS	3
(0021,xx54)	SIEMENS SMS-AX ACQ 1.0	Rotation Angle	SS	1
(0021,xx55)	SIEMENS SMS-AX ACQ 1.0	Image Rotation	US	1
(0021,xx56)	SIEMENS SMS-AX ACQ 1.0	Table Coordinates	SS	3
(0021,xx57)	SIEMENS SMS-AX ACQ 1.0	Isocenter Table Position	SS	3
(0021,xx58)	SIEMENS SMS-AX ACQ 1.0	Table Object Distance	DS	1
(0021,xx61)	SIEMENS SMS-AX ACQ 1.0	Large Volume Overlap	SS	1
(0021,xx62)	SIEMENS SMS-AX ACQ 1.0	Reconstruction Preset	US	1
(0021,xx63)	SIEMENS SMS-AX ACQ 1.0	3D Start Angle	SS	1
(0021,xx64)	SIEMENS SMS-AX ACQ 1.0	3D Planned Angle	SL	1
(0021,xx65)	SIEMENS SMS-AX ACQ 1.0	3D Rotation Plane Alpha	SL	1
(0021,xx66)	SIEMENS SMS-AX ACQ 1.0	3D Rotation Plane Beta	SL	1
(0021,xx67)	SIEMENS SMS-AX ACQ 1.0	3D First Image Angle	SL	1
(0021,xx68)	SIEMENS SMS-AX ACQ 1.0	3D Trigger Angle	SS	1-n
(0021,xx71)	SIEMENS SMS-AX ACQ 1.0	Detector Rotation	DS	1-n
(0021,xxA3)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Trigger Sequence	SQ	1
(0021,xxA4)	SIEMENS SMS-AX ACQ 1.0	3D Frame Reference Date Time	DT	1
(0021,xxA5)	SIEMENS SMS-AX ACQ 1.0	3D Cardiac Trigger Delay Time	FD	1
(0021,xxA6)	SIEMENS SMS-AX ACQ 1.0	3D R-R Interval Time Measured	FD	1
(0023,xx08)	SIEMENS SMS-AX QUANT 1.0	Calibration TOD Value	IS	1
(0025,xx00)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	View Native	US	1
(0025,xx01)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Series Number	US	1

Tag	Private Owner Code	Name	VR	VM
(0025,xx02)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Image Number	US	1
(0025,xx03)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Center	US	1
(0025,xx04)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Width	US	1
(0025,xx05)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Brightness	US	1
(0025,xx06)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Win Contrast	US	1
(0025,xx07)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Frame Number	US	1
(0025,xx08)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Mask Frame Number	US	1
(0025,xx09)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Opac	US	1
(0025,xx0A)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Number of Frames	US	1
(0025,xx0B)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Scene Duration	DS	1
(0025,xx0C)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Identifier LOID	LO	1
(0025,xx0D)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Scene VFR Info	SS	1-n
(0025,xx0E)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Original Frame ECG Position	SS	1
(0025,xx10)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Zoom Flag	SS	1
(0025,xx11)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Flexible Pixel Shift	US	1
(0025,xx12)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Number of Mask Frames	US	1
(0025,xx13)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Number of Fill Frames	US	1
(0025,xx14)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Series Number	IS	1
(0025,xx15)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Image Number	IS	1
(0025,xx16)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	Ready Processing Status	IS	1
(0029,xx08)	SIEMENS CSA NON-IMAGE	CSA Data Type	CS	1
(0029,xx09)	SIEMENS CSA NON-IMAGE	CSA Data Version	LO	1
(0029,xx10)	SIEMENS CSA NON-IMAGE	CSA Data Info	OB	1
(0029,xx08)	SIEMENS MEDCOM HEADER	MedCom Header Type	CS	1
(0029,xx09)	SIEMENS MEDCOM HEADER	MedCom Header Version	LO	1
(0029,xx10)	SIEMENS MEDCOM HEADER	MedCom Header Info	OB	1
(0029,xx20)	SIEMENS MEDCOM HEADER	MedCom History Information	OB	1
(0029,xx31)	SIEMENS MEDCOM HEADER	PMTF Information 1	LO	1
(0029,xx32)	SIEMENS MEDCOM HEADER	PMTF Information 2	UL	1
(0029,xx33)	SIEMENS MEDCOM HEADER	PMTF Information 3	UL	1
(0029,xx34)	SIEMENS MEDCOM HEADER	PMTF Information 4	CS	1
(0029,xx35)	SIEMENS MEDCOM HEADER	PMTF Information 5	UL	1
(0029,xx40)	SIEMENS MEDCOM HEADER	Application Header Sequence	SQ	1
(0029,xx41)	SIEMENS MEDCOM HEADER	Application Header Type	CS	1
(0029,xx42)	SIEMENS MEDCOM HEADER	Application Header ID	LO	1
(0029,xx43)	SIEMENS MEDCOM HEADER	Application Header Version	LO	1
(0029,xx44)	SIEMENS MEDCOM HEADER	Application Header Info	OB	1
(0029,xx50)	SIEMENS MEDCOM HEADER	Workflow Control Flags	LO	8
(0029,xx51)	SIEMENS MEDCOM HEADER	Arch. Management Flag Keep Online	CS	1
(0029,xx52)	SIEMENS MEDCOM HEADER	Arch. Mgmnt Flag Do Not Archive	CS	1
(0029,xx53)	SIEMENS MEDCOM HEADER	Image Location Status	CS	1

Tag	Private Owner Code	Name	VR	VM
(0029,xx54)	SIEMENS MEDCOM HEADER	Estimated Retrieve Time	DS	1
(0029,xx55)	SIEMENS MEDCOM HEADER	Data Size of Retrieved Images	DS	1
(0029,xx08)	SIEMENS MEDCOM OOG	MedCom OOG Type	CS	1
(0029,xx09)	SIEMENS MEDCOM OOG	MedCom OOG Version	LO	1
(0029,xx10)	SIEMENS MEDCOM OOG	MedCom OOG Info	OB	1
(0029,xx00)	CARDIO-D.R. 1.0	Standard Edge Enhancement Sequence	SQ	1
(0029,xx01)	CARDIO-D.R. 1.0	Convolution Kernel Size	US	2
(0029,xx02)	CARDIO-D.R. 1.0	Convolution Kernel Coefficients	US	1-n
(0029,xx03)	CARDIO-D.R. 1.0	Edge Enhancement Gain	FL	1
(2121,xx01)	PMI Private Calibration Module Version 2.0	Calibration Method	ST	1
(2121,xx02)	PMI Private Calibration Module Version 2.0	Calibration Method Info	ST	1
(2121,xx03)	PMI Private Calibration Module Version 2.0	Calibration Object Size	FL	1
(2121,xx04)	PMI Private Calibration Module Version 2.0	Calibration Object S Dev	FL	1
(2121,xx05)	PMI Private Calibration Module Version 2.0	Calibration Horizontal Pixel Spacing	FL	1
(2121,xx06)	PMI Private Calibration Module Version 2.0	Calibration Vertical Pixel Spacing	FL	1
(2121,xx08)	PMI Private Calibration Module Version 2.0	Calibration File Name	ST	1
(2121,xx09)	PMI Private Calibration Module Version 2.0	Calibration Frame Number	IS	1
(2121,xx0A)	PMI Private Calibration Module Version 2.0	Calibration Object Unit	SH	1
(2121,xx0B)	PMI Private Calibration Module Version 2.0	Averaged Calibrations Performed	SS	1
(2121,xx0C)	PMI Private Calibration Module Version 2.0	Auto Magnify Factor	FL	1
(2121,xx0D)	PMI Private Calibration Module Version 2.0	Horizontal Pixel S Dev	FL	1
(2121,xx0E)	PMI Private Calibration Module Version 2.0	Vertical Pixel S Dev	FL	1

Note: Please be informed that some of the Private Owner Codes contain double-spaces in the name definitions. The following term (only double-spaces marked) are defined:
SIEMENS SMS-AX<spc><spc>VIEW 1.0
SIEMENS SMS-AX<spc><spc>ACQ 1.0
SIEMENS SMS-AX<spc><spc>QUANT 1.0
SIEMENS SMS-AX<spc><spc>ORIGINAL IMAGE INFO 1.0

(All spaces not specially marked, are single spaces.)

8.3 Coded Terminology and Templates

not applicable

8.4 Grayscale Image Consistency

The high resolution TFT display monitor option of Artis zee/zeego comes with a DICOM Grayscale Standard Display Function (GSDF) compliant factory pre-setting. A typical working environment setup is assumed for ambient light.

8.5 Standard Extended/Specialized/Private SOP Classes

8.5.1 Standard Extended XA

The XA SOP Instances created by Artis zee/zeego are standard-extended by adding the following private module attributes.

Table 65 - Private Modules for Standard Extended XA

IE	Module	Reference	Usage	Note
Image	Edge Enhancement	8.5.1.1	U	private Filter Information
	Angio Viewing	8.5.1.2	U	private Viewing information
	Angio Acquisition	8.5.1.3	U	additional private Information about image Acquisition
	Angio Quantification	8.5.1.4	U	if image is calibrated for Quant
	Original Image Info	8.5.1.5	U	if derived image

U = User Option

8.5.1.1 Edge Enhancement Module

The table in this section contains private IOD Attributes that describe Edge Enhancement extensions due to the Dynamic Cardio Review definition.

Table 66 - (Private) Edge Enhancement Module

Attribute Name	Tag	Owner	Type	Notes
Standard Edge Enhancement Sequence	(0029,xx00)	CARDIO-D.R. 1.0	3	Standard formula according to Dyna view Extensions. For DSA images two items are provided, one item for native and a second for DSA viewing
>Convolution Kernel Size	(0029,xx01)	CARDIO-D.R. 1.0	1C	x-/y-size value pair. Each value shall be greater or equal to 3. Required if sequence is present
>Convolution Kernel Coefficients	(0029,xx02)	CARDIO-D.R. 1.0	1C	Row-by-row list of the kernel Coefficients. Required if sequence is present
>Edge Enhancement Gain	(0029,xx03)	CARDIO-D.R. 1.0	1C	Applied Filter gain Factor. Required if sequence is present

8.5.1.2 Angio Viewing Module

Table 67 - (Private) Angio Viewing Module Attributes

Attribute Name	Tag	Owner	Type	Notes
Review Mode	(0019,xx00)	SIEMENS SMS-AX VIEW 1.0	3	Special Modes for Angio Review. Defined Terms are 1 = REV_MAXFILL, 2 = REV_LOOP, 3 = REV_SCROLL, 4 = REV_STEREO_LOOP

Attribute Name	Tag	Owner	Type	Notes
Anatomical Background Percent	(0019,xx01)	SIEMENS SMS-AX VIEW 1.0	3	Percentage of Mix between Subtracted Image Result and Native Mask. Range is from 0 to 100.
Number of Phases	(0019,xx02)	SIEMENS SMS-AX VIEW 1.0	3	1-4 (1 or # of "Variable Frame Rate" acq phases)
Apply Anatomical Background	(0019,xx03)	SIEMENS SMS-AX VIEW 1.0	3	
Pixel Shift Array	(0019,xx04)	SIEMENS SMS-AX VIEW 1.0	3	4 * Number of Frames (0028,0008)
Brightness	(0019,xx05)	SIEMENS SMS-AX VIEW 1.0	3	SUB windowing
Contrast	(0019,xx06)	SIEMENS SMS-AX VIEW 1.0	3	SUB windowing
Enabled Shutter	(0019,xx07)	SIEMENS SMS-AX VIEW 1.0	3	Visualize shutter
Native Edge Enhancement Percent Gain	(0019,xx08)	SIEMENS SMS-AX VIEW 1.0	3	Percent gain for native display of images.
Native Edge Enhancement LUT Index	(0019,xx09)	SIEMENS SMS-AX VIEW 1.0	3	
Native Edge Enhancement Kernel Size	(0019,xx0A)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Percent Gain	(0019,xx0B)	SIEMENS SMS-AX VIEW 1.0	3	Percent gain for subtracted display of images.
Subtracted Edge Enhancement LUT Index	(0019,xx0C)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Kernel Size	(0019,xx0D)	SIEMENS SMS-AX VIEW 1.0	3	
Fade Percent	(0019,xx0E)	SIEMENS SMS-AX VIEW 1.0	3	
Flipped before Laterality Applied	(0019,xx0F)	SIEMENS SMS-AX VIEW 1.0	3	
Apply Fade	(0019,xx10)	SIEMENS SMS-AX VIEW 1.0	3	
Zoom	(0019,xx12)	SIEMENS SMS-AX VIEW 1.0	3	
Pan X	(0019,xx13)	SIEMENS SMS-AX VIEW 1.0	3	
Pan Y	(0019,xx14)	SIEMENS SMS-AX VIEW 1.0	3	
Native Edge Enhancement Adverse Percent Gain	(0019,xx15)	SIEMENS SMS-AX VIEW 1.0	3	
Subtracted Edge Enhancement Adverse Percent Gain	(0019,xx16)	SIEMENS SMS-AX VIEW 1.0	3	
Invert Flag	(0019,xx17)	SIEMENS SMS-AX VIEW 1.0	3	
Quant 1K Overlay	(0019,xx1A)	SIEMENS SMS-AX VIEW 1.0	3	Only Store Monitor and Store Reference Images in Quant (128 kbyte)
Original Resolution	(0019,xx1B)	SIEMENS SMS-AX VIEW 1.0	3	internal usage only
Auto Window Center	(0019,xx1C)	SIEMENS SMS-AX VIEW 1.0	3	
Auto Window Width	(0019,xx1D)	SIEMENS SMS-AX VIEW 1.0	3	
Auto Window Correct Value	(0019,xx1E)	SIEMENS SMS-AX VIEW 1.0	3	
Sigmoid Window Parameter	(0019,xx1F)	SIEMENS SMS-AX VIEW 1.0	3	

8.5.1.3 Angio Acquisition Data Module

The table in this section contains private IOD Attributes that describe additional Attributes for saving specific Angio Acquisition data.

Table 68 - (Private) Angio Acquisition Data Attributes

Attribute Name	Tag	Owner	Type	Notes
Acquisition Type	(0021,xx00)	SIEMENS SMS-AX ACQ 1.0	3	Technical Type of Acquisition performed to get image result. Defined Terms are 1 = fixed frame rate, 2 = variable frame rate (manually triggered), 3 = variable frame rate (time triggered), 4 = peri manual to head, 10 = dynavision manual inject., 11 = dynavision automatic, 14 = pulsed fluoro, 15 = ECG triggered fluoro 16 = scanning slow speed 17 = scanning fast speed
Acquisition Mode	(0021,xx01)	SIEMENS SMS-AX ACQ 1.0	3	Technical Mode of Acquisition performed to get image result. Defined Terms are: 0 = no mode specified, 1 = Digital Radiography, 2 = DSA, 3 = Peri-DSA, 4 = DR stepping, 5 = DR Dynavision (nat), 6 = Dynavision (sub), 7 = Card, 9 = 3D Mode 20 = Roadmap Fluoro, 21 = Normal Fluoro,
Foot Switch Index	(0021,xx02)	SIEMENS SMS-AX ACQ 1.0	3	
Acquisition Room	(0021,xx03)	SIEMENS SMS-AX ACQ 1.0	3	
Current Time Product	(0021,xx04)	SIEMENS SMS-AX ACQ 1.0	3	(uAs)
Dose	(0021,xx05)	SIEMENS SMS-AX ACQ 1.0	3	(uGy/pulse)
Skin Dose Percent	(0021,xx06)	SIEMENS SMS-AX ACQ 1.0	3	
Skin Dose Accumulation	(0021,xx07)	SIEMENS SMS-AX ACQ 1.0	3	(mGy)
Skin Dose Rate	(0021,xx08)	SIEMENS SMS-AX ACQ 1.0	3	
Copper Filter	(0021,xx0A)	SIEMENS SMS-AX ACQ 1.0	3	
Measuring Field	(0021,xx0B)	SIEMENS SMS-AX ACQ 1.0	3	
Total Steps	(0021,xx0E)	SIEMENS SMS-AX ACQ 1.0	3	Number of multi-frame images which make up a Peri or DR-Step acquisition
Dyna X-Ray Info	(0021,xx0F)	SIEMENS SMS-AX ACQ 1.0	3	Multiplicity of (4 * Number of Frames). (kV value, uA value, ms, uAs value) Only with Dyna Images
Gamma Input	(0021,xx10)	SIEMENS SMS-AX ACQ 1.0	3	
Gamma Output	(0021,xx11)	SIEMENS SMS-AX ACQ 1.0	3	
SH_STPAR	(0021,xx12)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with Gantry information.
Acquisition Zoom	(0021,xx13)	SIEMENS SMS-AX ACQ 1.0	3	0 = Off, 1 = On. Not to be mixed up with digital zoom from Viewing module.

Attribute Name	Tag	Owner	Type	Notes
Dyna Angulation Step	(0021,xx14)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01deg / pulse Only with rotational images
DDO Value	(0021,xx15)	SIEMENS SMS-AX ACQ 1.0	3	
DR Single Flag	(0021,xx16)	SIEMENS SMS-AX ACQ 1.0	3	1 = DR SINGLE, else single Frame DR acquisition
Source to Isocenter	(0021,xx17)	SIEMENS SMS-AX ACQ 1.0	3	(mm)
ECG Index Array	(0021,xx19)	SIEMENS SMS-AX ACQ 1.0	3	
FD Flag	(0021,xx1A)	SIEMENS SMS-AX ACQ 1.0	3	
SH_ZOOM	(0021,xx1B)	SIEMENS SMS-AX ACQ 1.0	3	
SH_COLPAR	(0021,xx1C)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with collimator information.
K-Factor	(0021,xx1D)	SIEMENS SMS-AX ACQ 1.0	3	
EVE	(0021,xx1E)	SIEMENS SMS-AX ACQ 1.0	3	
Total Scene Time	(0021,xx1F)	SIEMENS SMS-AX ACQ 1.0	3	
Restore Flag	(0021,xx20)	SIEMENS SMS-AX ACQ 1.0	3	
Stand Movement Flag	(0021,xx21)	SIEMENS SMS-AX ACQ 1.0	3	1 = movements during acquisition
FD Rows	(0021,xx22)	SIEMENS SMS-AX ACQ 1.0	3	Acquisition matrix, rows
FD Columns	(0021,xx23)	SIEMENS SMS-AX ACQ 1.0	3	Acquisition matrix, columns
Table Movement Flag	(0021,xx24)	SIEMENS SMS-AX ACQ 1.0	3	1 = for movements during acquisition
IC Stent Flag	(0021,xx27)	SIEMENS SMS-AX ACQ 1.0	3	
Gamma LUT Sequence	(0021,xx28)	SIEMENS SMS-AX ACQ 1.0	3	
>Gamma LUT Descriptor	(0021,xx40)	SIEMENS SMS-AX ACQ 1.0	3	
>Gamma LUT Type	(0021,xx41)	SIEMENS SMS-AX ACQ 1.0	3	
>Gamma LUT Data	(0021,xx42)	SIEMENS SMS-AX ACQ 1.0	3	
3D Cardiac Phase Center	(0021,xx2A)	SIEMENS SMS-AX ACQ 1.0	3	
3D Cardiac Phase Width	(0021,xx2B)	SIEMENS SMS-AX ACQ 1.0	3	
Organ Program Info	(0021,xx30)	SIEMENS SMS-AX ACQ 1.0	3	Technical data-structure with organ program information
mAs Modulation	(0021,xx3B)	SIEMENS SMS-AX ACQ 1.0	3	only for cardiac triggered 3D acquisition
3D R-Peak Reference Time	(0021,xx3C)	SIEMENS SMS-AX ACQ 1.0	3	one value per frame, only for cardiac triggered 3D acquisition
ECG Frame Time Vector	(0021,xx3D)	SIEMENS SMS-AX ACQ 1.0	3	one value per frame, only for ECG gated fluoro / acquisition
ECG Start Time of Run	(0021,xx3E)	SIEMENS SMS-AX ACQ 1.0	3	absolute time in sec (UTC), only for ECG gated fluoro / acquisition
3D Positioner Primary Start Angle	(0021,xx51)	SIEMENS SMS-AX ACQ 1.0	3	(deg) Only with rotational images
3D Positioner Secondary Start Angle	(0021,xx52)	SIEMENS SMS-AX ACQ 1.0	3	(deg) Only with rotational images
Stand Position	(0021,xx53)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm; x, y, z Only with rotational images
Rotation Angle	(0021,xx54)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 deg Only with rotational images

Attribute Name	Tag	Owner	Type	Notes
Image Rotation	(0021,xx55)	SIEMENS SMS-AX ACQ 1.0	3	Rotation in relation to default patient position 0 = not rotated, 1 = rotated in clockwise direction, 2 = rotated in counterclockwise direction, Only with rotational images
Table Coordinates	(0021,xx56)	SIEMENS SMS-AX ACQ 1.0	3	(mm); x, y, z Only with rotational images
Isocenter Table Position	(0021,xx57)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm; long, lat, height
Table Object Distance	(0021,xx58)	SIEMENS SMS-AX ACQ 1.0	3	Original (uncalibrated) table object distance
Large Volume Overlap	(0021,xx61)	SIEMENS SMS-AX ACQ 1.0	3	in 0.1 mm Only for 3D Large Volume acquisitions
3D Reconstruction Preset	(0021,xx62)	SIEMENS SMS-AX ACQ 1.0	3	Only with rotational images
3D Start Angle	(0021,xx63)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Planned Angle	(0021,xx64)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Rotation Plane Alpha	(0021,xx65)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Rotation Plane Beta	(0021,xx66)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D First Image Angle	(0021,xx67)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
3D Trigger Angle	(0021,xx68)	SIEMENS SMS-AX ACQ 1.0	3	in 0.01 deg Only with rotational images
Detector Rotation	(0021,xx71)	SIEMENS SMS-AX ACQ 1.0	3	(deg) One value / frame for rotational images one single value otherwise
3D Cardiac Trigger Sequence	(0021,xxA3)	SIEMENS SMS-AX ACQ 1.0	3	Only for cardiac triggered 3D acquisition
>3D Frame Reference Date Time	(0021,xxA4)	SIEMENS SMS-AX ACQ 1.0	3	
>3D Cardiac Trigger Delay Time	(0021,xxA5)	SIEMENS SMS-AX ACQ 1.0	3	
>3D R-R Interval Time Measured	(0021,xxA6)	SIEMENS SMS-AX ACQ 1.0	3	

8.5.1.4 Angio Quantification Module

The table in this section contains private IOD Elements that describe additional Attributes for advanced Angio Quantification and Calibration Results features.

Table 69 - (Private) Angio Quantification Module Attributes

Attribute Name	Tag	Owner	Type	Notes
Calibration TOD Value	(0023,xx08)	SIEMENS SMS-AX QUANT 1.0	3	
Calibration Method	(2121,xx01)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Method Info	(2121,xx02)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object Size	(2121,xx03)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object S Dev	(2121,xx04)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Horizontal Pixel Spacing	(2121,xx05)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Vertical Pixel Spacing	(2121,xx06)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration File Name	(2121,xx07)	PMI Private Calibration	3	Only for images calibrated for

Attribute Name	Tag	Owner	Type	Notes
		Module Version 2.0		Quant
Calibration Frame Number	(2121,xx08)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Object Unit	(2121,xx09)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Averaged Calibrations Performed	(2121,xx0A)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Auto Magnify Factor	(2121,xx0B)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Horizontal Pixel S Dev	(2121,xx0C)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Vertical Pixel S Dev	(2121,xx0D)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant
Calibration Method	(2121,xx0E)	PMI Private Calibration Module Version 2.0	3	Only for images calibrated for Quant

8.5.1.5 Original Image Info Module

The table in this section contains private IOD Attributes that describe additional original image data for derived images (e.g. Store Monitor Image).

Table 70 - (Private) Original Image Info Module Attributes

Attribute Name	Tag	Owner	Type	Notes
View Native	(0025,xx00)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Series Number	(0025,xx01)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Image Number	(0025,xx02)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Center	(0025,xx03)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Width	(0025,xx04)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Brightness	(0025,xx05)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Win Contrast	(0025,xx06)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Frame Number	(0025,xx07)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Mask Frame Number	(0025,xx08)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Opac	(0025,xx09)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Number of Frames	(0025,xx0A)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Original Scene Duration	(0025,xx0B)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Identifier LOID	(0025,xx0C)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	Set to "AXIM_READY_PROCESSED" when Ready Processing was applied
Original Scene VFR Info	(0025,xx0D)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	Number of phases, then followed by n pairs (Last Frame Number, then Frame Rate)
Original Frame ECG Position	(0025,xx0E)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Zoom Flag	(0025,xx10)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Flex	(0025,xx11)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Number of Mask Frames	(0025,xx12)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Number of Fill Frames	(0025,xx13)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	

Attribute Name	Tag	Owner	Type	Notes
Series Number	(0025,xx14)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Image Number	(0025,xx15)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	
Ready Processing Status	(0025,xx16)	SIEMENS SMS-AX ORIGINAL IMAGE INFO 1.0	3	

8.5.1.6 SOP Common Module - Image Type Extensions

Additional values for the image type attribute are used to designate the purpose of the SOP instance created by the Artis zee/zeego system. Please see the following table for details.

Table 71 - Image Type Extensions

Type of Scene/Image	Image Type
Single Plane Scene	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A (or B)
Biplane Scene	ORIGINAL\PRIMARY\BIPLANE A (or B)
Reference Image	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A(B)\REFIMAGE
Reference Image from CT	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE\CT REF
Reference Image from MR	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE\MR REF
Dynamic Reference Image (Dynamap)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A(B)\DYNAMAP
Store Monitor	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A(B)\STORE MONITOR
Perivision - Mask Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\PERI\MASK\n[1]
Perivision - Fill Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\PERI\FILL\n[1]
Dynavision - Mask Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\MASK
Dynavision - Fill Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\FILL
Dynavision - Injection Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\INJECTION
Dynavision - Washout Phase	ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\WASHOUT
3D Acquisition DR	ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\DR[2]
3D Acquisition DSA	ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\DSA[2]
3D Acquisition CARD	ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\CARD[2]
Store Fluoro Loop	DERIVED\PRIMARY\SINGLE PLANE\SINGLE A(or B)\STORE FLUORO
Store Biplane Fluoro Loop	DERIVED\PRIMARY\BIPLANE A(or B)\\STORE FLUORO
Quant Result Image	DERIVED\SECONDARY\<3rd to nth value from Original>\QUANT
Exam Protocol (Non-Image Object)	ORIGINAL\PRIMARY\SINGLE PLANE\\EXAM PROTOCOL

[1] the term "n" is replaced by the related Step Number where the Image was acquired. Step Numbers start with "1".
[2] Additional values with phase info are set

8.5.2 Standard Extended for other created SOP Class

Any SOP Instances created by Artis zee/zeego can be standard-extended by adding the following *syngo* private module attributes.

Table 72 - Private Modules for other created SOP Class

IE	Module	Reference	Usage	Note
Image	MEDCOM Header	8.5.2.3	U	private *syngo* information
	MEDCOM OOG	8.5.2.4	U	if object graphics is attached to image

U = User Option

8.5.2.1 MEDCOM Header

The table in this section contains private IOD Attributes that describe the MEDCOM Header:

Table 73 - MEDCOM Header Attributes

Attribute Name	Tag	Owner	Type	Notes
MedCom Header Type	(0029,xx08)	SIEMENS MEDCOM HEADER	1C	MedCom Header identification characteristics. Defined Terms: MEDCOM 1 (Required if MedCom Header Info (0029,xx10) present.)
MedCom Header Version	(0029,xx09)	SIEMENS MEDCOM HEADER	2C	Version of MedCom Header Info (0029,xx10) format. (Required if MEDCOM Header Info (0029,xx10) present.)
MedCom Header Info	(0029,xx10)	SIEMENS MEDCOM HEADER	3	Manufacturer model dependent information. The value of the attribute MedCom Header Info (0029,xx10) can be build up in each user defined format.
MedCom History Information	(0029,xx20)	SIEMENS MEDCOM HEADER	3	MedCom defined Patient Registration history information. See A.1.3.1.
PMTF Information 1	(0029,xx31)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 2	(0029,xx32)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 3	(0029,xx33)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 4	(0029,xx34)	SIEMENS MEDCOM HEADER	3	Transformation Information
PMTF Information 5	(0029,xx35)	SIEMENS MEDCOM HEADER	3	Transformation Information
Application Header Sequence	(0029,xx40)	SIEMENS MEDCOM HEADER	3	Sequence of Application Header items. Zero or more items are possible.
>Application Header Type	(0029,xx41)	SIEMENS MEDCOM HEADER	1C	Application Header identification characteristics. Required, if Sequence is sent.
>Application Header ID	(0029,xx42)	SIEMENS MEDCOM HEADER	3	Identification of an application header
>Application Header Version	(0029,xx43)	SIEMENS MEDCOM HEADER	3	Version of CSA Series Header Info (0029,xx44) format.
>Application Header Info	(0029,xx44)	SIEMENS MEDCOM HEADER	3	Application dependent information.
Workflow Control Flags	(0029,xx50)	SIEMENS MEDCOM HEADER	3	Eight free definable flags.
Archive Management Flag Keep Online	(0029,xx51)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system to keep the image always online (also when already archived). Enumerated Values: 00 = remote control not required 01 = keep image online
Archive Management Flag Do Not Archive	(0029,xx52)	SIEMENS MEDCOM HEADER	3	Flag to control remote archive management system not to archive the related image. Enumerated Values: 00 = remote control not required 01 = don't archive image
Image Location Status	(0029,xx53)	SIEMENS MEDCOM HEADER	3	Image location status to control retrieving. Defined Terms: ONLINE = retrieving has to be done as usual, NEARLINE = move request to SCP and delay according to value of Estimated Retrieve Time (0029,xx54), OFFLINE = invoking a retrieve operation initiates an operator request, INVALID = invoking a retrieve

Attribute Name	Tag	Owner	Type	Notes
				operation would always result in an error.
Estimated Retrieve Time	(0029,xx54)	SIEMENS MEDCOM HEADER	3	Estimated retrieve time in seconds. A value less then zero (< 0) indicates location is OFFLINE or INVALID.
Data Size of Retrieved Images	(0029,xx55)	SIEMENS MEDCOM HEADER	3	Data size of images in MByte.
Series Workflow Status	(0029,xx60)	SIEMENS MEDCOM HEADER2	3	

8.5.2.1.1 MEDCOM History Information

The value of the attribute MEDCOM History Information (0029,xx20) is defined in the following way:

Table 74 - MEDCOM History Information Attributes

Part	Name	Type	Bytes	Notes
header	Identifier	string	32	Always “CSA HISTORY”
	Version	string	32	e.g. “V1.10”
>n Items	Class Name	string	64	
	Modification String	string	1024	

8.5.2.2 MEDCOM OOG

The table in this section contains private IOD Attributes that describe MEDCOM Object Oriented Graphics (OOG). This module is used whenever object graphics is drawn on the image and need to be stored as graphic object properties. Given the condition that the module contents was not removed by other modalities, the graphic objects remain re-animatable if such an image was transferred and is then retrieved back.

Table 75 - MEDCOM OOG Attributes

Attribute Name	Tag	Owner	Type	Notes
CSA Series Header Type	(0029,xx08)	SIEMENS MEDCOM OOG	1	MEDCOM Object Oriented Graphics (OOG) identification characteristics. Defined Terms: MEDCOM OOG 1 MEDCOM OOG 2
CSA Series Header Version	(0029,xx09)	SIEMENS MEDCOM OOG	3	Version of MEDCOM OOG Info (0029,xx10) format.
CSA Series Header Info	(0029,xx10)	SIEMENS MEDCOM OOG	3	MEDCOM Object Oriented Graphics (OOG) data.

The graphics objects are also fully encoded in the Image Overlay Plane for compatibility with other products, which do not support the MedCom OOG module. Any system not supporting the MedCom OOG module shall remove the OOG module and its contents when modifying the image overlay plane content.

8.6 Private Transfer Syntaxes

No private Transfer Syntaxes are defined for or requested by Artis zee/zeego DICOM application.

8.7 Sorting Order Artis zee/zeego

This section discusses the sorting algorithms for Artis within the patient browser and directory overview.

8.7.1 Identification of Images

Original acquired images are identified by the following attribute contents:

Table 76 - Attributes for Identification of Original Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE B ORIGINAL\PRIMARY\BIPLANE A ORIGINAL\PRIMARY\BIPLANE B ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\PERI\MASK\n ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\PERI\FILL\n ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\MASK ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\INJECTION ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\FILL ORIGINAL\PRIMARY\SINGLE PLANE\PLANE A\DYNA\WASHOUT ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\DR ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\DSA ORIGINAL\PRIMARY\SINGLE PLANE\SINGL A(B)\3D ACQ\CARD DERIVED\PRIMARY\SINGLE PLANE\SINGLE A\STORE FLUORO DERIVED\PRIMARY\SINGLE PLANE\SINGLE B\STORE FLUORO DERIVED\PRIMARY\BIPLANE A\\STORE FLUORO DERIVED\PRIMARY\BIPLANE B\\STORE FLUORO
Series Time	(0008,0031)	Same as Acquisition Time
Acquisition Time	(0008,0032)	Time the acquisition of this image was performed
Content Time	(0008,0033)	Same as Acquisition Time (rule for acquired images)
Series Number	(0020,0011)	Same as Acquisition Number
Acquisition Number	(0020,0012)	Counts number of acquisitions. All images created during performance of this acquisition have the same number.
Instance Number	(0020,0013)	“1-based” counter for images. Indicates the creation order within the acquisition.

Store Monitor images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 77 - Attributes for Identification of Store Monitor Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\STORE MONITOR DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\STORE MONITOR
Series Time	(0008,0031)	Same as Acquisition Time. Store Monitor is in same series.
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed
Content Time	(0008,0033)	Time this image was created (Store Monitor was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"300-based" counter for images. Indicates the creation order of Store Monitor Reference images within this series

Store Reference images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 78 - Attributes for Identification of Store Ref Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\REFIMAGE DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\REFIMAGE

Attribute Name	Tag	Value
Series Time	(0008,0031)	Same as Acquisition Time. Store Reference image is in same series.
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed
Content Time	(0008,0033)	Time this image was created (Store Reference image was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"100-based" counter for images. Indicates the creation order of Store Reference images within this series

Quant Report images, derived from original images or Fluoro LIH, are identified by the following attribute contents:

Table 79 - Attributes for Identification of Quant Report Images

Attribute Name	Tag	Value
Image Type	(0008,0008)	DERIVED\SECONDARY\SINGLE PLANE\SINGLE A\QUANT DERIVED\SECONDARY\SINGLE PLANE\SINGLE B\QUANT
Series Time	(0008,0031)	Time this Quant image was created (Quant was performed)
Acquisition Time	(0008,0032)	Time the acquisition of the original image was performed
Content Time	(0008,0033)	Time this Quant image was created (Quant was performed)
Series Number	(0020,0011)	Same Number as Acquisition Number. (Reference to original Image)
Acquisition Number	(0020,0012)	Counts number of acquisitions. Refers to the acquisition number of the original image where this image was derived from.
Instance Number	(0020,0013)	"1-based" counter for images. Quant Reports are stored in new series.

EXAM PROTOCOL as XA image, created during transfer of X-Ray Radiation Dose SR, is identified by the following attribute contents:

Table 80 - Attributes for Identification of EXAM Protocol XA Image

Attribute Name	Tag	Value
Image Type	(0008,0008)	ORIGINAL\PRIMARY\SINGLE PLANE\SINGLE A\EXAM PROTOCOL
SOP Class UID	(0008,0016)	1.2.840.10008.5.1.4.1.1.12.1
Series Time	(0008,0031)	Exam Protocol is allocated with Patient Registration.
Acquisition Time	(0008,0032)	Time this protocol was created (i.e. transferred)
Content Time	(0008,0033)	Time this protocol was created (i.e. transferred)
Series Number	(0020,0011)	Fixed value of "999"
Acquisition Number	(0020,0012)	Fixed value of "999"
Instance Number	(0020,0013)	Fixed value of "999"

8.7.2 The Sorting Algorithms of the Artis Viewer

Artis zee/zeego has implemented sorting algorithms to display DICOM objects in the directory overview in a specific order. Sorting/Grouping in the Viewer Directory Overview occurs according the following rules:

1. Sort by Series Number
2. If Series Number matches: Group on Series Number, Sort by Instance Number
3. If Series Number and Instance Number each match: Group on Series Number, Sort by Content Time

In the case, that the user has selected "Scenes + Ref Images" or "Scenes + Store Monitor", the reference images or the store monitor images follow directly the image they had been derived from.

Example 1:

Patient "Test 1" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes" is selected under the "Dir Overview" button => only the acquired images are displayed.

Patient “Test 1”

Table 81 - Viewer image ordering - simple case

Study 1 Series 1 Image 1	Study 1 Series 2 Image 1	Study 1 Series 3 Image 1	

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 2:

Patient "Test 2" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes + Ref Images" is selected under the "Dir Overview" button => the acquired images and the corresponding reference images are displayed.

Patient "Test 2"

Table 82 - Viewer image ordering - with Reference images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 100	Study 1 Series 2 Image 1	Study 1 Series 2 Image 100
Study 1 Series 3 Image 1	Study 1 Series 3 Image 100		

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 3:

Patient "Test 3" with one Study, three Series with one acquired image, three Store Monitor Images and one Reference Image in each Series. "Scenes + Store Monitor" is selected under the "Dir Overview" button => the acquired images and the corresponding store monitor images are displayed.

Patient “Test 3”

Table 83 - Viewer image ordering - with Store Monitor images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 300	Study 1 Series 1 Image 301	Study 1 Series 1 Image 302
Study 1 Series 2 Image 1	Study 1 Series 2 Image 300	Study 1 Series 2 Image 301	Study 1 Series 2 Image 302
Study 1 Series 3 Image 1	Study 1 Series 3 Image 300	Study 1 Series 3 Image 301	Study 1 Series 3 Image 302

	Acquired Image
	Store Monitor Image
	Store Reference Image

Example 4:

For Scene #2 of Patient "Test 3" now a Quant Report is performed. According to Example 3, the Overview now sorts as follows:

Patient "Test 3"

Table 84 - Viewer image ordering - Store Monitor and Quant images

Study 1 Series 1 Image 1	Study 1 Series 1 Image 300	Study 1 Series 1 Image 301	Study 1 Series 1 Image 302
Study 1 Series 2 Image 1	Study 1 Series 2(Quant) Image 1(Quant)	Study 1 Series 2 Image 300	Study 1 Series 2 Image 301
Study 1 Series 2 Image 302	Study 1 Series 3 Image 300	Study 1 Series 3 Image 301	Study 1 Series 3 Image 302
Study 1 Series 3 Image 1			

	Acquired Image
	Store Monitor Image
	Store Reference Image
	Quant Report Image

8.7.3 The Sorting Algorithms of the Artis Browser

Besides the default sorting criteria, Artis supports the following sorting algorithms for the patient browser.

The default *syngo* sorting settings are as follows

- Artis displays images - within a Series - with the order they had been acquired
- Artis displays Series - within a Study - with the order they had been acquired
- Artis displays Studies - within a Patient - with the order they had been acquired

Therefore the Quant Report Series will not necessarily be displayed adjacent to the original scene, if created later at the end of all scenes.

8.8 Supported Matrix Sizes of Artis zee/zeego

Depending on detector size and mode the Artis zee/zeego supports different matrix sizes. These matrix sizes are also used by the Storage AE when sending the images to a remote SCP. Additionally it is possible to send images resized to 512x512 and 1024x1024.

Artis zee/zeego uses following original Matrix Sizes:

Detector Size	Rows (0028,0010)	Columns (0028,0011)
FD 30x40	2480	1920
	1920	2480
	1920	1920
	1440	1440
	1240	960
	1024	1024
	960	1240
	960	960
	720	720
	616	480
	512	512
	480	616
	480	480
	360	360
	256	256
FD 20x20	960	960
	776	776
	600	600
	480	480
	384	384
	296	296
	192	192

8.9 DICOM Print SCU - detailed status displays

The following tables document the behavior of the Artis zee/zeego DICOM Print AE in response to messages received for the Printer SOP Class and the Print Job SOP Class.

Definition of camera symbols:

Idle: Camera is installed and ready; idle icon is displayed.

Interact: The user has to react in near future, but not immediately.
Example: A camera was low in 8x10 clear sheets: LOW 8x10 CLR was sent by N-EVENT-REPORT.

Queue Stopped: The user has to react immediately. Either the camera needs immediate interaction or a job has been aborted.
Example: A camera is out of 8x10 clear sheets, or camera is down, or a film job is aborted

Note: different camera symbols are displayed according to the Printer Status Info.

8.9.1 Common Status Information

Table 85 - Print SCU Common Status Information

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
NORMAL	Camera is ready	Camera is ready	<None>/idle
BAD RECEIVE MGZ	There is a problem with the film receive magazine. Films from the printer cannot be transported into the magazine.	Problem with receive magazine.	<None>/interact
BAD SUPPLY MGZ	There is a problem with the film supply magazine. Films from this magazine cannot be transported into the printer.	Problem with supply magazine.	<None>/interact
CALIBRATING	Printer is performing self calibration, it is expected to be available for normal operation shortly.	Self calibration. Please wait.	<None>/idle
CALIBRATION ERR	An error in the printer calibration has been detected, quality of processed films may not be optimal.	Problem in calibration. Film quality may not be optimal.	<None>/interact
CHECK CHEMISTRY	A problem with the processor chemicals has been detected, quality of processed films may not be optimal.	Problem with chemistry. Film quality may not be optimal.	<None>/interact
CHECK SORTER	There is an error in the film sorter	Error in film sorter.	<None>/interact
CHEMICALS EMPTY	There are no processing chemicals in the processor, films will not be printed and processed until the processor is back to normal.	Camera chemistry empty. Please check.	<None>/interact
CHEMICALS LOW	The chemical level in the processor is low, if not corrected, it will probably shut down soon.	Camera chemistry low. Please check.	<None>/interact
COVER OPEN	One or more printer or processor covers, drawers, doors are open.	Camera cover, drawer or door open.	<None>/interact
ELEC CONFIG ERR	Printer configured improperly for this job.	Camera configured improperly for this job. Queue stopped.	**Queue for this camera will be STOPPED/ Queue stopped**
ELEC DOWN	Printer is not operating due to some unspecified electrical hardware problem.	Camera electrical hardware Problem.	<None>/interact
ELEC SW ERROR	Printer not operating for some unspecified software error.	Camera software problem. Queue stopped.	**Queue for this camera will be STOPPED/ Queue stopped**
EMPTY 8x10	The 8x10 inch film supply magazine is empty.	8x10 film supply empty.	<None>/interact
EMPTY 8x10 BLUE	The 8x10 inch blue film supply magazine is empty.	8x10 blue film supply empty.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
EMPTY 8x10 CLR	The 8x10 inch clear film supply magazine is empty.	8x10 clear film supply empty.	<None>/interact
EMPTY 8x10 PAPR	The 8x10 inch paper supply magazine is empty.	8x10 paper supply empty.	<None>/interact
EMPTY 10x12	The 10x12 inch film supply magazine is empty.	10x12 film supply empty.	<None>/interact
EMPTY 10x12 BLUE	The 10x12 inch blue film supply magazine is empty.	10x12 blue film supply empty.	<None>/interact
EMPTY 10x12 CLR	The 10x12 inch clear film supply magazine is empty.	10x12 clear film supply empty.	<None>/interact
EMPTY 10x12 PAPR	The 10x12 inch paper supply magazine is empty.	10x12 paper supply empty.	<None>/interact
EMPTY 10x14	The 10x14 inch film supply magazine is empty.	10x14 film supply empty.	<None>/interact
EMPTY 10x14 BLUE	The 10x14 inch blue film supply magazine is empty.	10x14 blue film supply empty.	<None>/interact
EMPTY 10x14 CLR	The 10x14 inch clear film supply magazine is empty.	10x14 clear film supply empty.	<None>/interact
EMPTY 10x14 PAPR	The 10x14 inch paper supply magazine is empty.	10x14 paper supply empty.	<None>/interact
EMPTY 11x14	The 11x14 inch film supply magazine is empty.	11x14 film supply empty.	<None>/interact
EMPTY 11x14 BLUE	The 11x14 inch blue film supply magazine is empty.	11x14 blue film supply empty.	<None>/interact
EMPTY 11x14 CLR	The 11x14 inch clear film supply magazine is empty.	11x14 clear film supply empty.	<None>/interact
EMPTY 11x14 PAPR	The 11x14 inch paper supply magazine is empty.	11x14 paper supply empty.	<None>/interact
EMPTY 14x14	The 14x14 inch film supply magazine is empty.	14x14 film supply empty.	<None>/interact
EMPTY 14x14 BLUE	The 14x14 inch blue film supply magazine is empty.	14x14 blue film supply empty.	<None>/interact
EMPTY 14x14 CLR	The 14x14 inch clear film supply magazine is empty.	14x14 clear film supply empty.	<None>/interact
EMPTY 14x14 PAPR	The 14x14 inch paper supply magazine is empty.	14x14 paper supply empty.	<None>/interact
EMPTY 14x17	The 14x17 inch film supply magazine is empty.	14x17 film supply empty.	<None>/interact
EMPTY 14x17 BLUE	The 14x17 inch blue film supply magazine is empty.	14x17 blue film supply empty.	<None>/interact
EMPTY 14x17 CLR	The 14x17 inch clear film supply magazine is empty.	14x17 clear film supply empty.	<None>/interact
EMPTY 14x17 PAPR	The 14x17 inch paper supply magazine is empty.	14x17 paper supply empty.	<None>/interact
EMPTY 24x24	The 24x24 inch film supply magazine is empty.	24x24 film supply empty.	<None>/interact
EMPTY 24x24 BLUE	The 24x24 inch blue film supply magazine is empty.	24x24 blue film supply empty.	<None>/interact
EMPTY 24x24 CLR	The 24x24 inch clear film supply magazine is empty.	24x24 clear film supply empty.	<None>/interact
EMPTY 24x24 PAPR	The 24x24 inch paper supply magazine is empty.	24x24 paper supply empty	<None>/interact
EMPTY 24x30	The 24x30 inch film supply magazine is empty.	24x30 film supply empty.	<None>/interact
EMPTY 24x30 BLUE	The 24x30 inch blue film supply magazine is empty.	24x30 blue film supply empty.	<None>/interact
EMPTY 24x30 CLR	The 24x30 inch clear film supply magazine is empty.	24x30 clear film supply empty.	<None>/interact
EMPTY 24x30 PAPR	The 24x30 inch paper supply magazine is empty.	24x30 paper supply empty.	<None>/interact
EMPTY A4 PAPR	The A4 paper supply magazine is empty.	A4 paper supply empty	<None>/interact
EMPTY A4 TRANS	The A4 transparency supply magazine is empty.	A4 transparency supply empty.	<None>/interact
EXPOSURE FAILURE	The exposure device has failed due to some unspecified reason.	Exposure device has failed.	<None>/interact
FILM JAM	A film transport error has occurred and a film is jammed in the printer or	Film jam.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
	processor.		
FILM TRANSP ERR	There is a malfunction with the film transport, there may or may not be a film jam.	Film transport problem.	<None>/interact
FINISHER EMPTY	The finisher is empty.	Finisher is empty.	<None>/interact
FINISHER ERROR	The finisher is not operating due to some unspecified reason	Finisher problem.	<None>/interact
FINISHER LOW	The finisher is low on supplies.	Finisher low.	<None>/interact
LOW 8x10	The 8x10 inch film supply magazine is low.	8x10 film supply low.	<None>/interact
LOW 8x10 BLUE	The 8x10 inch blue film supply magazine is low.	8x10 blue film supply low.	<None>/interact
LOW 8x10 CLR	The 8x10 inch clear film supply magazine is low.	8x10 clear film supply low.	<None>/interact
LOW 8x10 PAPR	The 8x10 inch paper supply magazine is low.	8x10 paper supply low.	<None>/interact
LOW 10x12	The 10x12 inch film supply magazine is low.	10x12 film supply low.	<None>/interact
LOW 10x12 BLUE	The 10x12 inch blue film supply magazine is low.	10x12 blue film supply low.	<None>/interact
LOW 10x12 CLR	The 10x12 inch clear film supply magazine is low.	10x12 clear film supply low.	<None>/interact
LOW 10x12 PAPR	The 10x12 inch paper supply magazine is low.	10x12 paper supply low.	<None>/interact
LOW 10x14	The 10x14 inch film supply magazine is low.	10x14 film supply low.	<None>/interact
LOW 10x14 BLUE	The 10x14 inch blue film supply magazine is low.	10x14 blue film supply low.	<None>/interact
LOW 10x14 CLR	The 10x14 inch clear film supply magazine is low.	10x14 clear film supply low.	<None>/interact
LOW 10x14 PAPR	The 10x14 inch paper supply magazine is low.	10x14 paper supply low.	<None>/interact
LOW 11x14	The 11x14 inch film supply magazine is low.	11x14 film supply low.	<None>/interact
LOW 11x14 BLUE	The 11x14 inch blue film supply magazine is low.	11x14 blue film supply low.	<None>/interact
LOW 11x14 CLR	The 11x14 inch clear film supply magazine is low.	11x14 clear film supply low.	<None>/interact
LOW 11x14 PAPR	The 11x14 inch paper supply magazine is low.	11x14 paper supply low.	<None>/interact
LOW 14x14	The 14x14 inch film supply magazine is low.	14x14 film supply low.	<None>/interact
LOW 14x14 BLUE	The 14x14 inch blue film supply magazine is low.	14x14 blue film supply low.	<None>/interact
LOW 14x14 CLR	The 14x14 inch clear film supply magazine is low.	14x14 clear film supply low.	<None>/interact
LOW 14x14 PAPR	The 14x14 inch paper supply magazine is low.	14x14 paper supply low.	<None>/interact
LOW 14x17	The 14x17 inch film supply magazine is low.	14x17 film supply low.	<None>/interact
LOW 14x17 BLUE	The 14x17 inch blue film supply magazine is low.	14x17 blue film supply low.	<None>/interact
LOW 14x17 CLR	The 14x17 inch clear film supply magazine is low.	14x17 clear film supply low.	<None>/interact
LOW 14x17 PAPR	The 14x17 inch paper supply magazine is low.	14x17 paper supply low.	<None>/interact
LOW 24x24	The 24x24 inch film supply magazine is low.	24x24 film supply low.	<None>/interact
LOW 24x24 BLUE	The 24x24 inch blue film supply magazine is low.	24x24 blue film supply low.	<None>/interact
LOW 24x24 CLR	The 24x24 inch clear film supply magazine is low.	24x24 clear film supply low.	<None>/interact
LOW 24x24 PAPR	The 24x24 inch paper supply magazine is low.	24x24 paper supply low.	<None>/interact
LOW 24x30	The 24x30 inch film supply magazine is low.	24x30 film supply low.	<None>/interact
LOW 24x30 BLUE	The 24x30 inch blue film supply	24x30 blue film supply	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
	magazine is low.	low.	
LOW 24x30 CLR	The 24x30 inch clear film supply magazine is low.	24x30 clear film supply low.	<None>/interact
LOW 24x30 PAPR	The 24x30 inch paper supply magazine is low.	24x30 paper supply low.	<None>/interact
LOW A4 PAPR	The A4 paper supply magazine is low.	A4 paper supply low.	<None>/interact
LOW A4 TRANS	The A4 transparency supply magazine is low..	A4 transparency supply low.	<None>/interact
NO RECEIVE MGZ	The film receive magazine is not available.	Film receiver not available.	<None>/interact
NO RIBBON	The ribbon cartridge needs to be replaced.	Replace ribbon cartridge.	<None>/interact
NO SUPPLY MGZ	The film supply magazine is not available.	Film supply not available.	<None>/interact
CHECK PRINTER	The printer is not ready at this time, operator intervention is required to make the printer available.	Check camera.	<None>/interact
CHECK PROC	The processor is not ready at this time, operator intervention is required to make the printer available.	Check processor.	<None>/interact
PRINTER DOWN	The printer is not operating due to some unspecified reason.	Camera down.	<None>/interact
PRINTER INIT	The printer is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.	Camera initializing.	<None>/Idle
PRINTER OFFLINE	The printer has been disabled by an operator or service person.	Camera off-line.	<None>/interact
PROC DOWN	The processor is not operating due to some unspecified reason.	Processor down.	<None>/interact
PROC INIT	The processor is not ready at this time, it is expected to become available without intervention. For example, it may be in a normal warm-up state.	Processor initializing.	<None>/Idle
PROC OVERFLOW FL	Processor chemicals are approaching the overflow full mark.	Processor chemicals near overflow.	<None>/interact
PROC OVERFLOW HI	Processor chemicals have reached the overflow full mark.	Processor chemicals overflow.	<None>/interact
QUEUED	Print job in Queue	--	<None>/Idle
RECEIVER FULL	The film receive magazine is full.	Receiver full.	<None>/interact
REQ MED NOT INST	The requested film, paper, or other media supply magazine is installed in the printer, but may be available with operator intervention.	Install media supply.	<None>/interact
REQ MED NOT AVAI	The requested film, paper, or other media requested is not available on this printer.	Media supply not available on this camera. Queue stopped. Change camera.	**Queue for this camera will be STOPPED/ Queue stopped**
RIBBON ERROR	There is an unspecified problem with the print ribbon.	Error with print ribbon.	<None>/interact
SUPPLY EMPTY	The printer is out of film.	Camera out of film.	<None>/interact
SUPPLY LOW	The film supply is low.	Film supply low.	<None>/interact
UNKNOWN	There is an unspecified problem.	Unspecified problem with camera.	<None>/interact

8.9.2 Additional Status Information - AGFA printers

Table 86 - Print SCU additional AGFA Printer Status evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
WARMING UP	Printer is in the warm-up stage. Spooling of print jobs to disk is still possible.	Camera is warming up.	<None>/idle

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
OFFLINE	OFFLINE Printer is switched off-line. Spooling of print jobs to disk is still possible.	Camera is switched off-line.	<None>/interact
NONE	General printer warning, no specific information is available. Spooling of print jobs to disk is still possible.	--	<None>/idle

8.9.3 Additional Status Information - Kodak PACS Link (formerly Imation)

Table 87 - Print SCU additional Kodak PACS Link Status evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
SUPPLY MGZ ERR	The supply magazine has an error.	Film supply has an error.	<None>/interact

8.9.4 Additional Status Information - Kodak 190l

Table 88 - Print SCU additional Kodak 190l Status evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
PRINTER STOPPED	The printer has stopped.	Camera has stopped.	<None>/interact
FATAL ERROR	Fatal Error.	Fatal Error. Queue stopped.	**Queue for this camera will be STOPPED/ Queue stopped**

8.9.5 Additional Status Information - Kodak 2180/1120

Table 89 - Print SCU additional Kodak 2180/1120 Status evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
PRINTER NOT RDY	Printer not ready.	Camera not ready..	<None>/interact
CHECK PROCESSOR	Check processor.	Check processor.	<None>/interact
NO TONER	No toner.	No toner.	<None>/interact
FATAL	Fatal Error.	Fatal Error. Queue stopped.	**Queue for this camera will be STOPPED/ Queue stopped**

8.9.6 Additional Status Information - Codonics

Table 90 - Print SCU additional Codonics Status evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
STANDARD	Printer is ready.	Camera is ready.	<None>/Normal
LOAD A-SIZE	Load A-Size media.	Load A-Size media.	<None>/interact
LOAD A-DVPAPER	Load A-Size black and white paper.	Load A-Size black and white paper.	<None>/interact
LOAD A-CVPAPER	Load A-Size color paper.	Load A-Size color paper.	<None>/interact
LOAD A-CVTRANS	Load A-Size transparencies.	Load A-Size transparencies.	<None>/interact
LOAD A4-SIZE	Load A4-Size media.	Load A4-Size media.	<None>/interact

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
LOAD A4-DVPAPER	Load A4-Size black and white paper.	Load A4-Size black and white paper.	<None>/interact
LOAD A4-CVPAPER	Load A4-Size color paper.	Load A4-Size color paper.	<None>/interact
LOAD A4-CVTRANS	Load A4-Size transparencies.	Load A4-Size transparencies.	<None>/interact
LOAD LA-SIZE	Load LA-Size media.	Load LA-Size media.	<None>/interact
LOAD LA-DVPAPER	Load LA-Size black and white paper.	Load LA-Size black and white paper.	<None>/interact
LOAD LA-CVPAPER	Load LA-Size color paper.	Load LA-Size color paper.	<None>/interact
LOAD LA-CVTRANS	Load LA-Size transparencies.	Load LA-Size transparencies.	<None>/interact
LOAD LA4-SIZE	Load LA4-Size media.	Load LA4-Size media.	<None>/interact
LOAD LA4-DVPAPER	Load LA4-Size black and white paper.	Load LA4-Size black and white paper.	<None>/interact
LOAD LA4-CVPAPER	Load LA4-Size color paper.	Load LA4-Size color paper.	<None>/interact
LOAD LA4-CVTRANS	Load LA4-Size transparencies.	Load LA4-Size transparencies.	<None>/interact
LOAD XLA-SIZE	Load XLA-Size media.	Load XLA-Size media.	<None>/interact
LOAD XLA-DVPAPER	Load XLA-Size black and white paper.	Load XLA-Size black and white paper.	<None>/interact
LOAD XLA-CVPAPER	Load XLA-Size color paper.	Load XLA-Size color paper.	<None>/interact
LOAD XLA-CVTRANS	Load XLA-Size transparencies.	Load XLA-Size transparencies.	<None>/interact
LOAD XLA4-SIZE	Load XLA4-Size media.	Load XLA4-Size media.	<None>/interact
LOAD XLA4-DVPAPER	Load XLA4-Size black and white paper.	Load XLA4-Size black and white paper.	<None>/interact
LOAD XLA4-CVPAPER	Load XLA4-Size color paper.	Load XLA4-Size color paper.	<None>/interact
LOAD XLA4-CVTRANS	Load XLA4-Size transparencies.	Load XLA4-Size transparencies.	<None>/interact
LOAD XLW-SIZE	Load XLW-Size media.	Load XLW-Size media.	<None>/interact
LOAD XLW-DVPAPER	Load XLW-Size black and white paper.	Load XLW-Size black and white paper.	<None>/interact
LOAD XLW-CVPAPER	Load XLW-Size color paper.	Load XLW-Size color paper.	<None>/interact
LOAD 8X10-SIZE	Load 8x10 media.	Load 8x10 media.	<None>/interact
LOAD 8X10-DVFILM	Load XLW-Size black and white film.	Load XLW-Size black and white film.	<None>/interact
SUPPLY MISSING	The film supply magazine specified for this job is not available.	Film supply not available.	<None>/interact
RIBBON MISSING	Ribbon is missing.	Ribbon is missing.	<None>/interact
RIBBON EMPTY	Ribbon is empty.	Ribbon is empty.	<None>/interact
TOP COVER OPEN	Top cover of printer is open.	Top cover of camera is open.	<None>/interact

8.9.7 Additional DICOM Execution Status Information

Table 91 - Print SCU additional DICOM Execution Status Info evaluation

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
INVALID PAGE DES	The specified page layout cannot be printed or other page description errors have been detected.	Film Job cannot be printed on this camera. Queue stopped. Please redirect film job.	**Queue for this camera will be STOPPED/ Queue stopped**
INSUFFICIENT MEMORY	There is not enough memory available to complete this job.	Not enough memory available in camera. Queue stopped. Please continue queue or change camera.	**Queue for this camera will be STOPPED/ Queue stopped**

Printer Status Info/ Execution Status Info	Description	Message string visible in 'Status Bar'	Other action for UI/ 'camera symbol'
NONE	General printer warning, no specific information is available. Spooling of print jobs to disk is still possible.	--	<None>/Idle

8.9.8 Unknown DICOM Execution Status Information

Printer Status Info and Execution Status Info are defined terms and can therefore be extended or reduced by camera manufacturers. Therefore Artis zee/zeego Print AE shall be flexible.

If any other printer status info or execution status info is received, Artis zee/zeego will react as shown in the following table:

Table 92 - Print SCU Unknown DICOM Execution Status Information

Printer Status/ Execution	Printer / Execution Status Info	Description	Message string visible in the HCD 'Status Bar'	Other action for UI/ 'camera symbol'
WARNING	<any other>	<not defined status info>	Camera Info: <status info>	<none/interact>
FAILURE	<any other>	<not defined status info>	Camera Info: <status info> Queue stopped	**Queue for this camera will be STOPPED/ Queue stopped**

Annex A: Index of Tables

Table 1 - Network Services 2
Table 2 - Media Services 2
Table 3 - Implementation Identifying Information 3
Table 4 - Revision History 6
Table 5 - Artis zee/zeego DICOM Data Flow Diagram 9
Table 6 - Presentation Context Table "Verification" 14
Table 7 - Presentation Context Table "Send to ..." 17
Table 8 - Presentation Context Table "Update Flag Information" 19
Table 9 - Presentation Context Table "Return Commitment Result" 21
Table 10 - Status codes "Save to local disk" 21
Table 11 - Presentation Context Table "Save to local disk" 22
Table 12 - Order of Preference Transfer Syntax 22
Table 13 - Presentation Context Table "Evaluate Commit Request" 24
Table 14 - Supported DIMSE-C Operations - Query/Retrieve SCU 25
Table 15 - Presentation Context Table "Search..." 26
Table 16 - C-FIND RQ Search Keys 26
Table 17 - Status Codes "Search..." 28
Table 18 - Presentation Context Table "Import..." 29
Table 19 - C-MOVE RSP Status Codes 29
Table 20 - Presentation Context Table "Process Search Requests" 31
Table 21 - Query/Retrieve SCP supported attributes 33
Table 22 - Status Codes Process Search Request 34
Table 23 - Presentation Context Table "Process Retrieve Requests" 35
Table 24 - Status Codes "Process Retrieve Requests" 35
Table 25 - Presentation Context Table "Print Film" 38
Table 26 - Basic Film Session N-CREATE attributes 39
Table 27 - Basic Film Session Status Codes 39
Table 28 - Basic Film Box N-CREATE attributes 40
Table 29 - Basic Film Box Status Codes 40
Table 30 - Basic Grayscale Image Box N-SET attributes 41
Table 31 - Basic Grayscale Image Box Status Codes 41
Table 32 - Presentation LUT N-CREATE attribute 42
Table 33 - Presentation LUT Status Codes 42
Table 34 - Used Printer N-EVENT Report attributes 42
Table 35 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes 42
Table 36 - Used Print Job N-EVENT Report attributes 43
Table 37 - Presentation Context Table "Show Device Status" 44
Table 38 - Used Printer N-EVENT Report attributes 44
Table 39 - Mandatory Printer N-GET-RSP, N-EVENT-REPORT-RQ attributes 44
Table 40 - Presentation Context “Update Worklist” 46
Table 41 - Supported Broad Worklist Query Search Key Attributes 46
Table 42 - Basic Worklist C-FIND-RSP Return Key Attributes 47
Table 43 - Status Codes "Update Worklist" 50
Table 44 - Patient based "narrow query" Search Key Attributes 51
Table 45 - Presentation Context “Patient Registered” 53
Table 46 - Performed Procedure Step N-CREATE Attributes 53
Table 47 - Status Codes "Patient Registered" 55
Table 48 - Performed Procedure Step N-SET Attributes 55
Table 49 - Status Codes "MPPS Update" 57
Table 50 - Default AET Characteristics 58
Table 51 - Remote AE Configuration Items 59
Table 52 - General parameter settings and timeouts 60
Table 53 - Supported Application Profiles 62
Table 54 - Application Data Flow DICOM Archive 62

Table 55 - Mapping of Application Profiles Supported 64
Table 56 - STD-GEN-xxx profile supported SOP Classes 65
Table 57 - Supported Single-Byte Character Sets (w/o Code Ext.) 67
Table 58 - Supported Single-Byte Character Sets (with Code Ext.) 67
Table 59 - Supported Multi-Byte Character Sets (w/o Code Ext.) 68
Table 60 - Supported Multi-Byte Character Sets (with Code Ext.) 68
Table 61 - XA acquired or derived image 70
Table 62 - Details on Accumulated X-Ray Dose Data 75
Table 63 - Details on Dose SR Irradiation Event Data 75
Table 64 - Data Dictionary of Private Attributes 79
Table 65 - Private Modules for Standard Extended XA 84
Table 66 - (Private) Edge Enhancement Module 84
Table 67 - (Private) Angio Viewing Module Attributes 84
Table 68 - (Private) Angio Acquisition Data Attributes 86
Table 69 - (Private) Angio Quantification Module Attributes 88
Table 70 - (Private) Original Image Info Module Attributes 89
Table 71 - Image Type Extensions 90
Table 72 - Private Modules for other created SOP Class 90
Table 73 - MEDCOM Header Attributes 91
Table 74 - MEDCOM History Information Attributes 92
Table 75 - MEDCOM OOG Attributes 92
Table 76 - Attributes for Identification of Original Images 93
Table 77 - Attributes for Identification of Store Monitor Images 93
Table 78 - Attributes for Identification of Store Ref Images 93
Table 79 - Attributes for Identification of Quant Report Images 94
Table 80 - Attributes for Identification of EXAM Protocol XA Image 94
Table 81 - Viewer image ordering - simple case 95
Table 82 - Viewer image ordering - with Reference images 96
Table 83 - Viewer image ordering - with Store Monitor images 97
Table 84 - Viewer image ordering - Store Monitor and Quant images 98
Table 85 - Print SCU Common Status Information 100
Table 86 - Print SCU additional AGFA Printer Status evaluation 103
Table 87 - Print SCU additional Kodak PACS Link Status evaluation 104
Table 88 - Print SCU additional Kodak 190I Status evaluation 104
Table 89 - Print SCU additional Kodak 2180/1120 Status evaluation 104
Table 90 - Print SCU additional Codonics Status evaluation 104
Table 91 - Print SCU additional DICOM Execution Status Info evaluation 105
Table 92 - Print SCU Unknown DICOM Execution Status Information 106